RSTS/E
System Generation Manual

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PREFACE

This manual describes the complete process for generating and installing a BASIC-PLUS run-time system, BASIC-PLUS system programs, and a monitor for Version V06B of RSTS/E, the PDP-11 Resource Sharing Time Sharing System/ Extended. The manual also presents information needed to change system characteristics, to optimally arrange system components, and to correct hardware and software problems. The material is of interest to those at an installation who are responsible for hardware and software policy and procedure. Certain information is also of interest to field service engineers, software support representatives, and system managers who are responsible for solving operational problems and for maintaining published changes to system software. Before attempting to generate a RSTS/E system, you should be familiar with the RSTS/E and BASIC-PLUS software, with the hardware on which RSTS/E will run, and with any published changes (patches) to system software.

Procedures for generating and installing diagnostic and optional software are described in other manuals provided with that software.

For more information on RSTS/E documentation for standard and optional software, consult the *RSTS/E Documentation Directory*. For information on hardware supplied with RSTS/E, consult the user documents that accompanied the system.

This manual uses the following symbology conventions:

- (LF) indicates pressing the LINE FEED key
- (RET) indicates pressing the RETURN key
- (ESC) indicates pressing the ESCAPE key (shown as ALT MODE on some terminals)

In addition, user input is underlined in all examples. Unless otherwise noted, user input is terminated by pressing the RETURN key.

For a quick reference to a subject in this guide, refer to the following list of topics.

If you need to know about:	See Section:
Adding more memory to RSTS/E	3.8.4.3
Adding swap files	3.7
Bootstrapping a device	Appendix A
Building system library files	6.2
Changing line printer characteristics	3.9.3
Changing system files	3.7.4
Changing the maximum job size allowed	3.8.1
Changing the maximum number of users	3.8.1
Changing the default run-time system	3.8.2
Configuration question considerations	4.2
Configuration question examples	Appendix G

Creating the TTYSET.SPD file	6.3.4
Creating user accounts	6.4
Determining memory requirements	Appendix D
Disabling devices and controllers	3.5.2, 3.9.4
Enabling DH11 and DZ11 modem service	3.9.2
Formatting disks	3.2
Generating additional BASIC-PLUS run-time systems	7.2
Installing patches	3.4
Making the use of a device privileged	3.9.5
Organization of the system disk	3.2
Starting timesharing operations	3.10
Updating the bad block file on a disk	3.7.6

CHAPTER 1
INTRODUCTION

Before generating a RSTS/E system, you should understand the fundamental elements of a RSTS/E system. You can then generate a system by performing the following steps, which are outlined in Figure 1-1.

1. Bootstrap the RSTS/E distribution medium (Step 1)
2. Use system initialization options to *tailor* a RSTS/E system (the SYSGEN system) supplied by DIGITAL to the needs of your installation. (Steps 2–11)
3. Use the SYSGEN system to generate a *target* RSTS/E system that supports the hardware and software your installation requires. (Steps 12–16)
4. Use system initialization options to tailor the target system to the needs of your installation. (Steps 18–25)
5. Build a library of RSTS/E system files (Steps 26–31)

NOTE

This documentation refers to the RSTS/E system generation (SYSGEN) system, the RSTS/E target system, and their system disks. DIGITAL supplies the SYSGEN system on a distribution disk, magtape, or DECtape. The SYSGEN system is a RSTS/E system that can run on any RSTS/E hardware configuration. While running the SYSGEN system, you generate a target system, which supports the hardware and software features that your installation requires. This manual calls the disk or tape supplied by DIGITAL the *distribution disk or tape.* This disk or tape is always mounted write-protected. The *SYSGEN system disk* is the disk to which you copy the SYSGEN files and on which you perform the system generation. The *target system disk* is the disk on which the target system is placed. At some installations, this disk and the SYSGEN disk are the same.

After you generate the first target system, you can generate additional monitors and BASIC-PLUS run-time systems. These can replace the original versions permanently or can be installed for temporary use. You can generate them during timesharing and tailor them immediately before using them as described in Chapter 7.

1.1 FUNDAMENTALS OF RSTS/E

Every RSTS/E system has a system disk that contains the following elements:

- A RSTS/E file structure
- The system initialization code
- A monitor Save Image Library (SIL)
- A run-time system
- An error message file
- A swapping file
- Auxiliary system files (optional)

The RSTS/E file structure on the system disk includes a bootstrap block and three directories. One directory is the Master File Directory (MFD) account[1,1]. It contains entries for itself, for the system file account[0,1], and for the system library account [1,2]. (Nonsystem disks do not require a system library account.) The MFD also includes the pack cluster size and disk pack identification (pack ID). In addition, the MFD notes whether the disk is public or private and whether the directories for the files on the disk retain the data on which the files were last accessed or the date on which the files were last modified. The second directory, which is catalogued in the MFD, is the User File Directory (UFD) for account [0,1]. This directory initially contains entries for the files SATT.SYS and BADB.SYS. The third directory is the UFD for account[1,2], which (after the system library build procedure) contains system library files.

The file SATT.SYS, which RSTS/E requires in account[0,1] on each disk, is a storage allocation table for that disk. SATT.SYS maps which disk clusters are allocated and which are free. BADB.SYS, also required on each disk, is the file to which the bad blocks found on that disk are allocated. (A bad block is a block from which the system cannot reliably read data.) The initialization code permanently allocates bad blocks to BADB.SYS to prevent their allocation to another file.

During system generation, you can use the system initialization code (INIT.SYS) to write a file structure on disks that will be used under RSTS/E. The system initialization code is a stand-alone program that contains routines to initialize disks, create system files, enable and disable peripheral devices, install a monitor, set system defaults, and perform other tasks that are necessary to create the RSTS/E operating environment.

A monitor Save Image Library (SIL) contains the actual operating system code – i.e., the RSTS/E monitor code and the File Processor (FIP) overlay code. It also includes global symbol values (which allow symbolic monitor patching), space for monitor default specification and patches, and an index of its contents. The system generation process runs programs that link the monitor and overlay code and build a SIL.

The RSTS/E system permits more than one monitor to be on a disk simultaneously; of course, only one is installed (i.e., in use as the monitor for timesharing) at any time. For example, an installation might have one monitor installed during the daytime for applications use and a different monitor installed at night for program development. Before any monitor can be installed, however, it must be in account [0,1]. The monitor SIL file can be written anywhere on the system disk and need not be contiguous.

RSTS/E provides translators, called run-time systems, to control the interface between user jobs and the monitor. The system associates each job with a run-time system. The run-time system issues the proper monitor directives to perform whatever operations the job specifies. The system loads a run-time system upon receiving a request from a job for that run-time system. The request can be a special run-time system command or merely a command to run a program that is associated with a particular run-time system. A run-time system is code that jobs may share. Once a run-time system has been added to the system, any number of jobs can be associated with it. The monitor brings the run-time system into memory automatically whenever one of the jobs associated with the run-time system is running. The run-time system is the primary controller for the job. It interprets job input and directs the monitor accordingly.

RSTS/E requires as the system default a run-time system that is a keyboard monitor. The keyboard monitor prompts the user at the terminal and accepts RSTS/E command strings.

The default run-time system for RSTS/E systems is normally BASIC-PLUS. The BASIC-PLUS run-time system accepts input from logged-out terminals and logs in jobs (with the LOGIN program). It prompts users at terminals for input (the READY message) and accepts command strings (ASSIGN, RUN, and SAVE among others). In addition, the BASIC-PLUS run-time system includes a language processor. This facility enables a user to enter, debug, and execute programs in the BASIC-PLUS language.

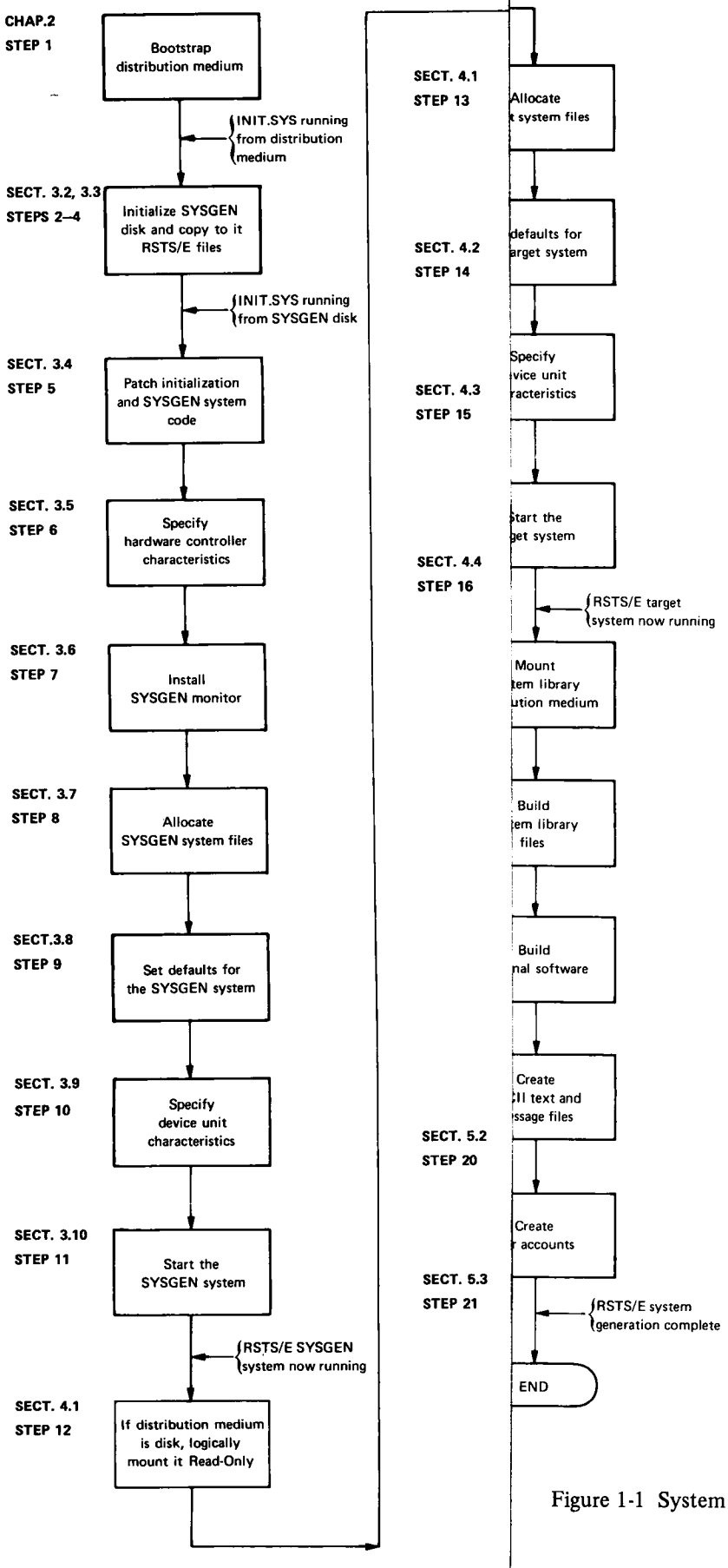

Figure 1-1 System Generation Flow Chart

The default run-time system for the SYSGEN system is RT11. This run-time system emulates many monitor functions of DIGITAL's RT11 operating system. DIGITAL provides and supports the RT11 run-time system and utility programs solely for the purposes of RSTS/E system generation.

Each system includes the error message file ERR.ERR so that RSTS/E can notify users with the appropriate text whenever an error occurs.

The RSTS/E system needs a swapping file – i.e., contiguous disk space in which it can place jobs it has swapped out of memory. You can allocate the swapping space as one or more files and/or one or more non-file-structured swapping disks. One swapping file, SWAP.SYS, is always required on the system disk. You can allocate other files or disks for swapping depending upon your installation's requirements and resources. The system must include enough swapping space to hold all the jobs on the system at any given time (each job at its maximum size).

Four auxiliary RSTS/E system files (OVR,SYS, ERR.SYS, BUFF.SYS, and CRASH.SYS), may also exist. The system can access the overlay code directly from the SIL or from a separate file (named OVR.SYS) on a nonsystem disk. If your system includes an auxiliary fixed head disk, you may be able to improve system performance by creating OVR.SYS. The file ERR.SYS is a copy of ERR.ERR, which is the system error message file. As with OVR.SYS, you can create ERR.SYS on an auxiliary fixed head disk to increase access speed. All systems configured for DECtape require BUFF.SYS, which provides the buffer space necessary for DECtape operations. CRASH.SYS is necessary if you enable the crash dump facility. If a fatal monitor error occurs while the crash dump facility is enabled, the system dumps the contents of the read/write area of the monitor to the CRASH.SYS file. DIGITAL strongly recommends that you create the CRASH.SYS file and enable the crash dump facility.

The remaining sections of this chapter provide an overview of Chapters 2 through 7. In addition to the usual text, this manual includes five sections summarizing the system generation procedures described in each chapter. These sections, which are on colored paper, are intended for use by those experienced at generating Version V06B of RSTS/E. Note that Chapter 2, intended for all users, contains only procedural information and is therefore on colored paper.

1.2 BOOTSTRAPPING THE DISTRIBUTION MEDIUM

The first step in system generation is to use the hardware bootstrap loader to bootstrap the initialization code into memory from the distribution medium. Chapter 2 describes the procedures to follow to bootstrap the distribution medium. DIGITAL distributes RSTS/E on 7-track and 9-track magtape, RK05 and RK06 disk cartridge, and DECtape. The distribution media contain the initialization code and other programs and data files needed to generate and tailor a RSTS/E system.

System generation procedures (except for the mounting and dismounting of distribution volumes) are essentially the same for all the distribution media.

1.3 TAILORING THE RSTS/E SYSGEN SYSTEM

After you bootstrap the distribution medium, you can use the initialization options (as described in Chapter 3) to tailor the SYSGEN system for your installation. The SYSGEN system is configured at DIGITAL to support a minimal number of each standard RSTS/E device – four RK05 units, two units of each other disk type, two DECtape units, two units of each magtape type, two keyboards (the console keyboard and one pseudo keyboard), one line printer, etc. During the tailoring procedure, you must use options that perform the following functions:

1. Initialize RSTS/E disks (DSKINT option)
2. Copy SYSGEN system files from the distribution medium to the system disk (COPY option)
3. Correct the system code (PATCH option)
4. Specify the hardware configuration if necessary (HARDWR option)
5. Install the SYSGEN monitor (INSTALL option)
6. Allocate system files for the SYSGEN system (REFRESH option)
7. Set system defaults (DEFAULT option)
8. Specify characteristics of device units (e.g., line printer) if necessary (SET option)
9. Start timesharing with the SYSGEN system (START option)

If the console terminal for your system is not a standard type, you may need to set its fill factor (for use by the initialization code) before using any other option. Use the FILL option to do so.

In addition to the listed options, the initialization code includes three other options, which enable you to bootstrap devices, load stand-alone programs, and enable only the console terminal. These options are not generally required during the tailoring of the SYSGEN system.

1.4 GENERATING THE RSTS/E TARGET SYSTEM

After tailoring and starting the SYSGEN system, your next step is to generate a target system. The system generation process uses several programs that copy and edit files, ascertain the system configuration, and assemble and link components of the RSTS/E target monitor. The distribution medium contains a program that copies the necessary files to the system generation disk and chains to another program, which asks the system configuration questions.

Answering the configuration questions involves declaring permanent settings in the RSTS/E monitor code and BASIC-PLUS run-time system. These settings indicate the devices and optional software the system will support. Examples of configured elements include the device controllers in the RSTS/E monitor and the mathematical functions in the BASIC-PLUS run-time system. The only way to change the configuration is to regenerate the system. Configuring a system is different from tailoring a system. When you tailor a RSTS/E system, you specify variable factors for the RSTS/E monitor. You can change the tailored elements within their configured limits any time the initialization code is running.

After answering the configuration questions, the next step is to run another batch stream, which generates the target monitor and BASIC-PLUS run-time system.

1.5 TAILORING THE TARGET SYSTEM

Your next step is to tailor the target system as described in Chapter 5. Using the same initialization options that you used to tailor the SYSGEN system, do the following:

1. Initialize RSTS/E disks (DSKINT option)
2. Specify the hardware configuration if necessary (HARDWR option)
3. Install the target monitor (INSTALL option)
4. Correct the system code (PATCH option)
5. Allocate the system files (REFRESH option)
6. Set system defaults (DEFAULT option)
7. Specify characteristics for device units, if necessary (SET option)
8. Start timesharing with the target monitor (START option)

1.6 BUILDING THE SYSTEM LIBRARY FILES

DIGITAL supplies a library of system programs in the distribution kit. After tailoring the target system, you can begin to build the library. Chapter 6 explains building the system library, producing text and message files, and creating user accounts. The build procedure copies the system programs to the system disk and compiles them. You can then use the library programs (if necessary) to build optional software packages, such as the FORTRAN IV and COBOL languages. You can also use the system library programs to produce files containing information for users and files containing commands to be issued at system start up. As your final step, create user accounts. You can then make the RSTS/E system available for general use.

1.7 REGENERATING RSTS/E

You can generate additional RSTS/E monitors, BASIC-PLUS run-time systems, or both during RSTS/E timesharing using the RT11 run-time system. (You need not use the SYSGEN monitor.) Chapter 7 describes generating a RSTS/E monitor and/or BASIC-PLUS run-time system on line. After ensuring that all the system generation programs are on the system, you can run the SYSGEN.SAV program, which asks the configuration questions.

After you answer the configuration questions, you can (using SYSBAT.SAV) start the batch file that generates the monitor and/or BASIC-PLUS run-time system. After the batch run terminates, you can shut down the running system at a convenient time and use the initialization code to tailor and start the new system. If you generate only a run-time system, you can use the initialization code to make it the system default or use the UTILTY program to add it as an auxiliary run-time system.

CHAPTER 2

BOOTSTRAPPING THE DISTRIBUTION MEDIUM

DIGITAL distributes RSTS/E on magtape, DECtape, and disk cartridge media. Your first step in generating a RSTS/E system is to bootstrap the system initialization code into memory from the distribution medium. The following sections describe the bootstrap procedures for each of the distribution media. Figure 2-1 is a flowchart of Step 1.

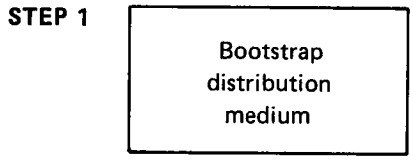

Figure 2-1 Bootstrap Procedure

STEP 1. Bootstrapping the Distribution Medium

Procedure:

a. For magtape distribution:

Section 23.6 of the *RSTS/E System User's Guide* describes the operation of the magtape devices. To bootstrap the magtape, proceed as follows:

Mount the system generation tape on unit 0 with the write enable ring removed. This tape is labelled:

DEC-11-ORSPA-E-MC9 for a 9-track TU10, TS03, TU16, or TU45 drive
DEC-11-ORSPA-E-MC7 for a 7-track TU10 drive

NOTE

The magtape bootstrap in the system initialization code will not use a TU16 or TU45 tape drive if a TU10 or TS03 drive is present. Therefore, if your system includes drives of both types (TU10/TS03 and TU16/TU45), bootstrap the distribution tape on the TU10 or TS03 drive.

Ensure that the tape is at its load point. (The LD PT indicator light comes on.) The computer does not bootstrap the device unless the tape is at its load point.

Set the ON-LINE/OFF-LINE switch on the tape unit to ON-LINE and ensure that the RDY indicator is lit.

Ensure that the console terminal is on-line.

Follow the instructions in Appendix A for the type of hardware bootstrap device that is on the system.

b. For DECtape distribution:

Section 23.5 of the *RSTS/E System User's Guide* describes the operation of the DECtape device. To bootstrap the DECtape, proceed as follows:

Mount the DECtape reel labelled DEC-11-ORSBA-E-UC1 (SYSTEM GENERATION TAPE 1 of 2) on unit 0.

Mount the DECtape reel labelled DEC-11-ORSBA-E-UC2 (SYSTEM GENERATION TAPE 2 of 2) on unit 1.

On DECtape units 0 and 1, set the REMOTE/OFF/LOCAL switch to REMOTE and the WRITE ENABLE/WRITE LOCK switch to WRITE LOCK.

Ensure that the console terminal is on-line.

Bootstrap unit 0 by following the instructions in Appendix A for the type of hardware bootstrap device that is on the system.

c. For disk cartridge distribution:

To bootstrap the disk cartridge, proceed as follows:

Insert in a free unit the cartridge labelled

DEC-11-ORSPA-E-HC for an RK05 disk drive
DEC-11-ORSPA-E-BC for an RK06 disk drive

Ensure that the RDY light is on.

Ensure that the WR PROT light is on.

Ensure that the console terminal is on-line.

Follow the instructions in Appendix A for the type of hardware bootstrap device that is on the system.

CHAPTER 3

TAILORING THE SYSGEN SYSTEM

After you bootstrap the distribution medium, your next step in system generation is to tailor the SYSGEN system for your installation. The initialization code includes 13 options that you can use to tailor the SYSGEN system. The following sections describe the initialization options.

3.1 OVERVIEW OF INITIALIZATION OPTIONS

When you bootstrap the RSTS/E distribution disk or tape, the RSTS/E system initialization code is loaded into memory. The RSTS/E system initialization code (INIT.SYS) is a collection of routines that create the RSTS/E file structure, system files, and start-up conditions for RSTS/E timesharing. The initialization code allows you to start the special SYSGEN monitor, which you can then use to generate a target RSTS/E system. When the target system generation process is complete, you can shut down the SYSGEN system and use the initialization code again to install the target system monitor and start timesharing.

The initialization code is one large stand-alone program with many functions. Initialization code routines (options) create a RSTS/E disk environment, install the monitor and run-time system, and set system defaults. Initialization routines also check the integrity of the system disk and load stand-alone programs. They allow you to patch system components, declare device characteristics, and disable hardware units and controllers.

Table 3-1 lists all the initialization options. This chapter describes all the initialization options. Usually, you need not use all the options in tailoring the SYSGEN system. A brief description of each option follows.

1. The disk initialization routines (DSKINT) initialize, format, and perform pattern checks on any RSTS/E disk. They write the minimum RSTS/E file structure and can create the library account [1,2].
2. The file copying routines (COPY) copy system files to an initialized RSTS/E system disk from the distribution medium or system tape.
3. Patching routines (PATCH) allow you to alter the RSTS/E system code or the INIT.SYS code to correct errors. Patches are published in the RSTS/E Release Notes and in monthly software publications.
4. Device controller routines (HARDWR) allow you to enable and disable device controllers, specify non-standard addresses and vectors for device controllers, and specify DM11-BB and DH11 associations.
5. Monitor installing routines (INSTALL) designate the Save Image Library file to be used as the monitor for a SYSGEN or target system.
6. The file manipulation routines (REFRESH) allow you to create and position system swapping files, update the bad block file, and arrange optional system files on the system disk or any auxiliary disk.
7. The default setting routines (DEFAULT) set system default start-up conditions. Among these conditions are job and swap maximums, the default run-time system, and the error message file.
8. Device characteristic routines (SET) enable and disable device units, set and reset modem control for keyboards, place and remove restrictions on the use of device units, and set line printer unit features.
9. Start-up routines (START) start the RSTS/E system for SYSGEN or normal timesharing. These routines load monitor tables, enable devices, and load the monitor and default run-time system into memory. START also allows you to override previously set system defaults for one timesharing session.
10. Bootstrap routines (BOOT) simulate the hardware bootstraps. They load an operating system into memory from disk or tape, or reload the initialization code into memory after you have corrected it on disk.
11. Loading routines (LOAD) load into memory and execute any stand-alone program.

12. A special diagnostic routine (UNISYS) allows you to start a RSTS/E system (by typing UNISYS and then typing START) with only the console terminal enabled. Problems sometimes occur in the terminal interfaces of new systems. These problems can prevent the start of timesharing when the start-up code fails to enable the terminal interfaces. UNISYS helps to isolate the problem to the terminal interface configuration by allowing you to start the system with only the console terminal enabled.
13. Fill factor routines (FILL) tell the terminal driver in the initialization code to insert the proper number of fill characters when printing messages on the console terminal.
14. A help option (HELP) prints a list of valid options.

Table 3-1
Initialization Options

Option Name	Abbreviation	Meaning
DSKINT	DS	Initialize and optionally format a disk. Check for bad blocks.
COPY	CO	Copy required RSTS/E files from distribution medium (or system tape) to system disk and bootstrap the system disk.
PATCH	PA	Alter RSTS/E system code to correct problems.
HARDWR	HA	Specify device controller characteristics.
INSTALL	IN	Install a RSTS/E monitor.
REFRESH	RE	Create or rebuild the system files in account [0,1] on any initialized RSTS/E disk; rebuild the storage allocation table for a disk; add bad blocks to BADB.SYS.
DEFAULT	DE	Establish or change a monitor's start-up defaults.
SET	SE	Set device characteristics on a unit-by-unit basis.
START	ST or LINE FEED key	Start timesharing operations.
BOOT	BO	Bootstrap a device.
LOAD	LO	Load a stand-alone program from account [0,1].
UNISYS	UN	Enable only the console terminal interface. Used as a diagnostic tool with the START option.
FILL	FI	Set the fill factor of the console terminal for the initialization code.
HELP	HE	Print a help message.

The user interface with the initialization code is a dialogue. Most questions in the dialogue have a long form and a short form. The initialization code automatically prints the short question. To receive the long form question, press the RETURN key in response to the short form question. Long form questions usually include information that may help you to answer the dialogue questions. For example, pressing the RETURN key in response to the DSKINT option's PACK CLUSTER SIZE? question yields a list of valid pack cluster sizes for the disk you are initializing.

The initialization code dialogue begins with the OPTION: prompt and returns to this prompt after the execution of each option. Typing HELP in response to OPTION: gives you a list of valid responses, as in the following example.

```
Option: HELP

The valid RSTS initialization options are:
        START    Start timesharing
        <LF>     Start timesharing (fast)
        DSKINT   Initialize disk to RSTS file structure
        HARDWR   Set controller characteristics
        BOOT     Bootstrap a device
        LOAD     Load a stand-alone program
        INSTALL  Install a monitor SIL
        REFRESH  Manipulate files in [0,1]
        DEFAULT  Set monitor defaults
        SET      Set device characteristics
        COPY     Copy minimal system to disk
        PATCH    Patch a file
        HELP     Type this HELP message
        FILL     Set console fill for INIT
        UNISYS   Disable all but console terminal
Only the first two characters need be typed.


Option:
```

To request an option, type the first two or more characters of its name. The initialization code proceeds directly to execute the requested option. You can type the CTRL/C combination in response to any question during the execution of the option to abort execution and return to the OPTION: prompt.

Using the initialization options, perform the following steps to tailor the RSTS/E SYSGEN system:

1. DSKINT option – If you plan to put the SYSGEN and target systems on separate disks, first mount and initialize the target disk. Dismount it if you need the disk drive for the SYSGEN disk. After initializing the target disk (if necessary), initialize the SYSGEN disk and leave it mounted.
2. COPY option – Copy system files from the distribution medium to the SYSGEN system disk. The COPY option automatically bootstraps the SYSGEN system disk.
3. PATCH option – If necessary, correct errors in the initialization code.
4. HARDWR option – If necessary, disable device controllers, specify nonstandard UNIBUS addresses and floating vectors for device controllers, and specify the associations of DM11-BBs with DH11 multiplexers.
5. INSTALL option – Install the file SYSGEN.SIL as the RSTS/E monitor for system generation.
6. PATCH option – If necessary, correct errors in the SYSGEN monitor code.
7. REFRESH option – Allocate swapping and other system files for the SYSGEN system.
8. DEFAULT option – Establish SYSGEN monitor defaults for job and swap maximums, the run-time system (RT11), the error message file, the installation name, the allocation of memory space, the crash dump facility, and the labelling format for magtapes.

9. SET option – If necessary, disable device units, enable modem control for keyboard lines, restrict the use of device units, and set type, width, and case for line printer units.
10. START option – Start timesharing on the SYSGEN system with RT11 as the default run-time system.

Note that if your console terminal is not an ASR33, KSR33, VT05, VT50, VT52, LA30, or LA36, you may need to use the FILL option (described in Section 3.14) immediately after using the COPY option. The FILL option sets the console terminal fill factor used by the initialization code for the current system device.

After starting the SYSGEN system, proceed to Chapter 4 to configure the target system.

3.2 INITIALIZING DISKS

Before using any disk under RSTS/E, you must initialize it. Initialization consists of formatting the disk, performing pattern checks on the disk for bad blocks, and writing a RSTS/E file structure on the disk. Initialization is necessary for fixed head and moving head disks. The only exceptions are disks to be used non-file-structured only, such as swapping units and foreign (non-RSTS/E) volumes.

NOTE

Do not initialize a disk that contains any important information such as a monitor SIL or other files. Initialization destroys the data on the disk. Do not initialize the distribution disk.

Formatting (which should be done for RK05, RK05F, RP02, RP03, RP04, RP05, and RP06 disks) means writing the necessary timing and sense marks onto the disk and erasing any extraneous information. You must format all removable disks (except RK06 disks, which are formatted at the factory) at least once before using them on a RSTS/E system.

You can choose from one to eight possible patterns (which DIGITAL supplies) to check for bad blocks on a disk. You can also specify up to eight patterns of your own. DIGITAL recommends that you use two or more patterns; the initialization code requires that you use at least one pattern. Using a larger number of patterns increases the probability that all bad blocks will be found and decreases the possibility that you will lose data later by writing into a bad block.

The RSTS/E file structure, which is described in Section 1.1, contains a bootstrap block and two directories. The Master File Directory (MFD) account [1,1] contains entries for itself and the system file account [0,1], the disk pack identification (pack id), pack cluster size, and designates whether the files on the disk are catalogued according to the date they were last accessed or the date they were last changed. It also designates the disk as public or private. The User File Directory (UFD) for account [0,1], contains entries for the files SATT.SYS and BADB.SYS.

During disk initialization you can request the creation of the system library account [1,2] on the disk. If you are initializing a system disk, the disk initialization routines create the account [1,2] automatically.

3.2.1 Initializing a Disk for Optimal Performance

The disk initialization process allows you to set up a disk for optimal performance. When you specify pack, MFD, and library cluster sizes, and position the file SATT.SYS, you can set up the disk to reduce access time and head movement.

The disk pack cluster size must be a power of 2. It cannot be less than the device cluster size for the disk (which may be 1, 2, 4, or 8) nor greater than 16. The pack cluster size is the minimum number of disk blocks that the system can allocate to a file on the disk pack. It is thus the minimum account and file cluster size as well. Specifying a large pack cluster size for a disk increases the speed of creation and extension of files on that disk by reducing the size of the storage allocation table (SATT.SYS). A large pack cluster size can, however, cause disk space to be wasted. For example, if the pack cluster size for a disk is 8, even a file that physically requires only 1 block is allocated 8 disk blocks (1 pack cluster).

The MFD cluster size, which cannot be less than the pack cluster size nor greater than 16, is the cluster size for account [1,1]. This value limits the number of user accounts possible on the system to approximately 108 times the MFD cluster size. DIGITAL recommends that the MFD cluster size be equal to the pack cluster size unless the system requires a larger number of accounts than that value allows.

You must set the system library [1,2] cluster size to at least 4. A larger value may be necessary if you intend to store many of your own library files in account [1,2]. The maximum number of files allowed in this account (or any other) is approximately 72 times the UFD cluster size for the account. This estimate may not be true for accounts with large files or for systems that use the optional RSX emulator. Files with attributes (which are normally created only by the RSX emulator) consume additional directory space in the UFD. The maximum number of files with attributes that can be saved under an account is approximately 54 times the UFD cluster size for that account.

You have two options regarding the positioning of the file SATT.SYS: you can specify its position yourself, or you can let DSKINT find a place for it. Positioning the file yourself is most advantageous on a moving-head system disk. In this system, you can group all system files near the middle of the disk to reduce average seek time for the disk heads. If DSKINT positions the file, it is placed in the first available space.

3.2.2 Performing the Initialization

To initialize a disk, use the DSKINT initialization option. If you plan to put the SYSGEN and target systems on separate disks, first mount and initialize the target disk. Dismount it if you need the disk drive for the SYSGEN disk. After initializing the target disk (if necessary), initialize the SYSGEN disk. Use different pack ids for the SYSGEN disk, the target disk, and the distribution disk (if present). Leave the SYSGEN disk mounted. Note that you must initialize each half of an RK05F disk separately. Therefore, to initialize an RK05F, you must use the DSKINT option twice. Table 3-2 summarizes the DSKINT dialogue. After you answer the questions in the dialogue, DSKINT begins the initialization process.

The first user-specified process that DSKINT performs is formatting. DSKINT prints STARTING FORMAT PASS when it begins formatting, and END FORMAT PASS when it completes formatting the disk. The time required for formatting depends on the size and type of disk involved.

After it formats the disk, DSKINT runs the pattern checks and counts the bad clusters. If DSKINT finds 161 or more bad clusters, it prints the message EXCESSIVE BAD CLUSTERS and returns the OPTION: prompt. Use a different disk. If the pack contains fewer than 161 bad clusters, DSKINT builds the RSTS/E file structure. When the building of the file structure is complete, DSKINT returns to the OPTION: prompt. Several examples are in the following two sections.

3.2.3 Initializing a System Disk

In this example, a user initializes the disk to be used as the SYSGEN system disk. The printout from the dialogue follows. Each line is marked with a letter and is explained in the subsequent text.

```
Option: DS

DD-MMM-YY? 08-SEP-76
00:01? 9:45

Disk? DK                                  line a
Unit? 1                                   line b
Pack ID? SYSGEN                           line c
Pack cluster size? 1                      line d
SATT.SYS base? 0                          line e
MFD password? SYSGEN                      line f
MFD cluster size? 2                       line g
PUB, PRI, or SYS? SYS                     line h
Library password? SYSLIB                  line i
Library UFD cluster size? 4               line j
Date last modified? NO                    line k
Format? Y                                 line l
Patterns? 3                               line m
Proceed (Y or N)? Y                       line n
Starting format pass
End format pass
Pattern # 3
Pattern # 2
Pattern # 1

Option:
```

Table 3-2
DSKINT Dialogue Questions

Question	Description of Response
DD-MMM-YY?	Type the current date in the format shown, as in 13-AUG-76. Press the LINE FEED key to accept the date printed in the prompt.
HH:MM?	Type the current time in 24-hour or AM/PM format. For example, 14:53 or 2:53 PM. Press the LINE FEED key to accept the time printed in the prompt.
DISK?	Type two characters to indicate the type of disk being initialized. Acceptable entries are DC, DF, DS, DK, DM, DP, or DB.
UNIT?	For DS, DK, DM, DP, and DB disks only. Type the physical unit number on which the disk, DECpack, or disk pack resides. Acceptable entries are 0 through 7, inclusive. For an RK05F, use DSKINT twice, once for each half of the disk (i.e., once for each of two units).
PLATTERS(n)?	For DF and DC type disks only. The value n in the prompt is the number of platters that the initialization code found. Press the LINE FEED key to use n as the number of platters. Otherwise, type the number of platters connected to the RF11 or RC11 controller. Acceptable entries are 1 through 8 for DF disks and 1 through 4 for DC disks.
PACK ID?	Type one to six alphanumeric characters to be used when logically mounting the disk.
PACK CLUSTER SIZE?	Type the number of 256-word blocks that each cluster allocated on the disk will contain. Acceptable pack cluster sizes are 1, 2, 4, 8, or 16 for RS64, RS11, RS03, RS04, RK05, RK05F, and RK06 disks. For RP02 and RP03 disks, acceptable values are 2, 4, 8, or 16. For RP04 and RP05 disks, acceptable values are 4, 8, or 16. For RP06 disks, acceptable values are 8 or 16.
SATT.SYS BASE?	Type the logical block number (from 1 to the device size minus 1) in decimal at which to locate the file SATT.SYS on the disk. DSKINT rounds this number up to the next pack cluster boundary. Type the LINE FEED key or 0 to let DSKINT routines position the file at the first available space. Appendix C contains a table of device sizes.
MFD PASSWORD?	Type one to six alphanumeric characters, which become the password of account [1,1] on the disk.
MFD CLUSTER SIZE?	Type the decimal number of 256-word blocks that each cluster allocated to the MFD will contain. The MFD cluster size must be a power of 2 greater than or equal to the pack cluster size and less than or equal to 16. The number of user accounts that can be created is approximately 108 times the MFD cluster size. This setting is permanent; you can change it only by re-initializing the disk.
PUB, PRI, OR SYS?	Type PUB to designate the disk as public. Type PRI to designate the disk as private. Type SYS to initialize a system disk.
CREATE LIBRARY ACCOUNT?	For PUB or PRI disks only. Type Y to create the account [1,2] on the disk. If you type N, DSKINT does not create the account and does not ask the next two questions.

Table 3-2 (Cont.)
DSKINT Dialogue Questions

Question	Description of Response
LIBRARY PASSWORD?	Type one to six alphanumeric characters, which become the password of account [1,2].
LIBRARY UFD CLUSTER SIZE?	Type the number of 256-word blocks allocated for each of the seven possible UFD clusters for the library account [1,2]. The number of files that can be stored under any account is approximately 72 times the UFD cluster size. The library UFD cluster size must be a power of 2. It cannot be less than the pack cluster size or greater than 16. DIGITAL recommends that the library UFD cluster size be at least 4.
DATE LAST MODIFIED?	Type Y to retain in the disk directory the date on which files on the disk were last modified. Type N or the LINE FEED key to retain the date on which files were last accessed.
FORMAT?	For DK, DM, DP, and DB disks only. Type Y to write hardware timing and sense data on the disk. Type N to omit the formatting operation. If you type Y, DSKINT routines print messages indicating the start and end of the format pass. You must format all new disk packs and cartridges (except RK06 disks) before using them on a RSTS/E system. You should never format a disk that contains any important data; formatting destroys the data on the disk.
PATTERNS?	To print the time required to execute each pattern for each type of disk, press the RETURN key. To specify the number of patterns to use in checking for bad blocks, type a number from one to eight. If you append an X to your response, DSKINT uses the specified number of DIGITAL's patterns and asks the next question.
YOUR PATTERN?	Asked only if the response to the last question ended with the letter X. (This capability is intended primarily for DIGITAL field service engineers.) Type an octal word between 1 and 177777, inclusive. The DSKINT option repeats the question until you have typed 8 patterns or pressed the LINE FEED key to indicate no more patterns.
PROCEED (Y OR N)?	Type Y to proceed with the disk initialization. Type N to abort the initialization and return to the OPTION: prompt. This question allows you to double-check your responses to the dialogue questions and abort the initialization if you have made any errors.

At line a, the user types the device designator of the disk to be used as the SYSGEN disk. Valid device designators are DF, DC, DS, DK, DM, DP, and DB. The query at line b, which DSKINT prints for DS, DK, DM, DP, and DB disks, requests the unit number of the device on which the disk is mounted. For an RS11 (DF) disk, the PLATTERS? query replaces the UNIT? query. The user would respond to the PLATTERS? query by typing the number of RS11 disks (platters) connected to the RF11 controller.

In response to the PACK ID query at line c, the user types one to six alphanumeric characters, which become the pack identification label for the disk. RSTS/E uses this label as a system-wide logical name for the disk and internally as the password of system account [0,1].

At line d, the user specifies the pack cluster size for the system disk. Refer to Appendix C for a list of disk device sizes. The pack cluster size must be at least the device cluster size and no greater than 16. In general, large pack cluster sizes

permit faster access to data stored on the disk at the expense of wasted disk space. Small pack cluster sizes permit more efficient allocation of disk storage space at the expense of frequent access to retrieval information (pointers to file data) stored in user file directories. You can improve the access speed on a disk with a small pack cluster size by clustering individual files and user file directories (UFDs) at a size greater than the pack cluster size. DIGITAL recommends the minimum cluster size for almost all installations.

At line e, the user specifies a base address for SATT.SYS, which is the storage allocation table for the disk.

The user types, at line f, one to six alphanumeric characters which become the password for the Master File Directory (MFD) account [1,1]. The MFD password should be kept secret, because irresponsible access to the MFD (or to any privileged account) can destroy system security.

At line g, the user specifies the cluster size for the MFD. With the restriction that the MFD cluster size cannot be less than the pack cluster size, the MFD cluster size can be 1, 2, 4, 8, or 16. The system manager can create approximately (108 *MFD cluster size) accounts. DIGITAL recommends that the MFD cluster size be the same as the pack cluster size unless the system requires more accounts than that value would allow.

The user types SYS at line h to initialize a system disk. For a system disk, DSKINT automatically creates the library account [1,2] and prints the queries at lines i and j. At line i, the user types one to six alphanumeric characters, which become the password for account [1,2]. The user specifies 4 as the cluster size for account [1,2] at line j. The cluster size for the system library must be at least 4. You may need to specify a larger cluster size if you plan to save many of your installation's library files in account [1,2].

The user types NO in response to the DATE LAST MODIFIED? query at line k. Therefore, the system will retain the date on which files on the disk were last accessed and not the date on which the files were last changed.

At line l, the user requests that DSKINT format the disk. At line m, he requests the use of three patterns to check for bad blocks. Since he has made no errors in his responses, he types Y in answer to the query at line n.

3.2.4 Initializing a Nonsystem Disk

The DSKINT option initializes, formats, and does pattern checking on nonsystem disks that will be used on the RSTS/E system. (System disk initialization is described in Section 3.2.3.) The example that follows applies only to nonsystem disks. Note that DSKINT must be run separately for each half of an RK05F.

The following example initializes an RK05 cartridge as a private disk:

```
RSTS V06B (DBO)


Option: DS

14-OCT-76? (LF)
18:27? (LF)

Disk? DK
Unit? 0
Pack ID? MYPACK
Pack cluster size? 1
SATT.SYS base? (LF)
MFD password? DATA
MFD cluster size? 2
PUB, PRI, or SYS? PRI
Create library account? NO
Date last modified? NO
```

```
Format? Y
Patterns? 3
Proceed (Y or N)? Y
Starting format pass
End format pass
Pattern # 3
Pattern # 2
Pattern # 1

Option:
```

In the example, the pattern checks discovered no bad blocks. When bad blocks are found, however, DSKINT prints a summary of the block number, cluster, and hardware information (for use by DIGITAL field service personnel). The following example (for an RP04 disk) shows the summary:

```
Starting format pass
End format pass
Pattern # 3

 Block Cluster    RBCS1    RBWC     RBBA     RBDA     RBCS2    RBDS     RBER

160593   20073   144250   177734   046344   001420   040300   150700   100000
Pattern # 2
Pattern # 1


Option:
```

3.2.5 Initializing a Non-File-Structured Disk

You can use the DSKINT option to perform pattern checking on disks that you will use non-file-structured for swapping. Such disks do not require the RSTS/E file structure that DSKINT creates. The file structure is useless and is overwritten during timesharing operations.

During initial hardware installation or when a hardware malfunction is suspected, DSKINT can supplement the tests performed by standard diagnostic methods. DSKINT does not duplicate all the tests performed by diagnostic programs and should be used only in addition to standard hardware maintenance procedures.

The example that follows shows the use of DSKINT to run pattern checks on an RF11 fixed head disk.

```
Option: DS

22-SEP-76?(LF)
10:57?(LF)

Disk? DF
Platters (2)?(LF)
Pack ID? SWAP
Pack cluster size? 1
SATT.SYS base?(LF)
MFD password? SWPMFD
MFD cluster size? 1
PUB, PRI, or SYS? PUB
Create library account? NO
Date last modified? NO
Patterns? 8
```

```
Proceed (Y or N)? Y
Pattern # 8
Pattern # 7
Pattern # 6
Pattern # 5
Pattern # 4
Pattern # 3
Pattern # 2
Pattern # 1


Option:
```

If DSKINT discovers bad blocks on a fixed head disk, you should not use the disk non-file-structured for swapping. Call DIGITAL field service to locate the hardware problem. You can avoid the bad blocks by using the disk for file-structured swapping space. Refer to Section 3.7.1.1 for a discussion of swapping files.

3.2.6 DSKINT Dialogue Error Messages

Table 3-3 summarizes the error messages that can appear during the DSKINT option dialogue.

Table 3-3
DSKINT Dialogue Error Messages

Message	Meaning
BLOCK NUMBER TOO BIG	The block number you typed is greater than or equal to the maximum logical block number for the disk.
DRIVE NOT READY	The initialization cannot proceed because the disk to be initialized is not on-line and ready. You can ready the drive and press the LINE FEED key to proceed or you can type CTRL/C to abort the initialization.
DSKINT NOT LEGAL ON SYSTEM DISK	You specified the disk from which the initialization code was bootstrapped. You cannot initialize this disk now because the initialization code would be destroyed.
ILLEGAL DISK NAME	The string you typed is not the name of a valid RSTS/E disk device.
ILLEGAL NUMBER, TRY AGAIN	The number you typed is not a valid octal number between 1 and 177777.
SORRY, BUT THAT DISK DOESN'T EXIST	The string you typed is a valid RSTS/E disk name, but that disk controller or the unit number does not exist on this system.

The preceding table describes only the errors that can occur during the DSKINT option dialogue. For information on the error messages that can appear during the initialization process, refer to Appendix B.

3.3 COPYING SYSTEM FILES TO DISK

The COPY option copies system files to the SYSGEN disk from account [0,1] on the distribution medium (during tailoring of the SYSGEN system) or to the target disk from account [0,1] on a system tape (during tailoring of the target system). The following are the files:

1. INIT.SYS, which is the system initialization code
2. SYSGEN.SIL (for the SYSGEN system) or the first file in [0,1] with the extension .SIL (for the target system), which is the RSTS/E monitor Save Image Library
3. RT11.RTS (for the SYSGEN system) or the first file in [0,1] with the extension .RTS (for the target system), which is the run-time system
4. ERR.ERR (for the SYSGEN system) or the first file in [0,1] with the extension .ERR (for the target system), which is the RSTS/E error message text
5. All files in [0,1] with the extension .SAV, which are stand-alone programs that can be loaded by the LOAD option

The COPY option automatically copies the files from the device that was last bootstrapped. If you are tailoring a SYSGEN system, the option copies the files from the distribution disk or tape. If you are tailoring a target system, the option copies the files from the system tape written by the batch stream.

As it attempts to transfer each file, COPY scans the output disk for a file with the same name. If it finds one, COPY issues the following prompt, substituting the filename and extension for filnam.ext.

FILE filnam.ext EXISTS:

Press the RETURN key for the following additional information:

```
The file named above already exists on the output disk.
Type 'D' to delete it and create a new file of the same name.
Type 'S' to skip this input file and continue.
Type CONTROL/C to abort the COPY operation:
```

After each filename scan, COPY creates the file on the output disk and copies the contents of the input file to it. However, COPY neither creates nor copies the file if it finds the file on the output disk and if you specify 'S'. The COPY option does not generate an error if one or more of the input files is missing.

After COPY has transferred all the files, it scans the output disk to verify that account [0,1] contains a minimal set of system files (INIT.SYS, a .SIL file, a .RTS file, and a .ERR file). If one or more of the files is missing, COPY prints an error message and returns to the OPTION: prompt. If all the files are present, it bootstraps the output disk and returns to the OPTION: prompt. Therefore, the initialization code is running with a different system device after the COPY option completes.

The following is an example of the COPY option:

```
Option: COPY

22-SEP-76? (LF)
11:00? (LF)

To which disk? DK
Unit? 1
```

```
RSTS V06B (DK1)

Option:
```

In the example, the user presses the LINE FEED key to accept the date and time printed. He then specifies the disk and unit number to which to copy the files. The COPY option copies the files, then bootstraps the output disk. When the disk has been bootstrapped, the initialization code prints the system identification message and the OPTION: prompt.

Table 3-4 summarizes the error messages that can appear during the COPY option dialogue.

Table 3-4
COPY Option Dialogue Error Messages

Message	Meaning
CANNOT COPY TO THE SYSTEM DISK	You specified the current system disk, which is invalid as an output disk for the COPY option.
ILLEGAL DISK NAME	You typed an invalid disk name or specified a unit number for a DC or DF disk.
INVALID UNIT NUMBER	The disk unit number you specified does not exist on this PDP-11.
INVALID RESPONSE	Your response to the FILE filnam.ext EXISTS: prompt was not D, S, or CTRL/C.
SORRY, BUT THAT DISK DOESN'T EXIST	The disk type you specified does not exist on this PDP-11.

For information on errors that occur during the copying operation, refer to Appendix B.

3.4 CORRECTING THE SYSTEM CODE

The RSTS/E initialization code provides a method for altering RSTS/E system code as errors are found and corrections are published. DIGITAL publishes patches in the RSTS/E Release Notes (available with the release) if problems are uncovered in a new system release version after a current system release but before the new release version is available from DIGITAL's Software Distribution Center. Between releases, patches are published in the monthly software publications.

You can patch any file in account [0,1]. This account includes the initialization code (INIT.SYS) and any SIL. Patching makes permanent changes to the code on disk and has no effect on the code currently in memory. Therefore, after patching the initialization code, you must bootstrap the system disk to load the corrected initialization code into memory.

Patches take many different forms. Some are in-place patches to one or more words in one or more modules. Others require patch space in the affected areas. The RSTS/E monitor, initialization code, and run-time system always include patch space. You can patch the overlay code by using free space in overlay segments or monitor patch space. Sometimes, patches affect fixed addresses and are straightforward; usually, however, the exact octal address of a patch varies from system to system. Published patches describe in detail the procedures required to make the alterations correctly.

When you generate a new RSTS/E system, refer to the RSTS/E Release Notes for patches and patching information. Unless instructed otherwise by the RSTS/E Release Notes, you should install all required patches immediately after the SIL is placed on the SYSGEN or target system disk. This procedure is necessary because patches may affect the initialization code, which builds required file structures, creates system files, and sets up tables used during timesharing.

3.4.1 Using the PATCH Option

Use the PATCH option to perform patching operations. To invoke PATCH, type PATCH or PA. PATCH replies by asking for the name of the file to patch, a MODULE NAME (if the file is a SIL and has more than one module), a BASE ADDRESS, and an OFFSET ADDRESS.

In response to the FILE TO PATCH? query, type the name and extension of the file that requires patching. Press the LINE FEED key to patch the installed monitor SIL. Since the initialization code cannot always distinguish a SIL from other files, the published patch may append /N to the name of any file that is not a SIL.

The module name designates the SIL module to be patched. You can obtain a list of SIL modules by pressing RETURN in response to the MODULE NAME? question. The base address defines the actual locations to be patched. For example, if you are patching the PRINT USING section of BASIC-PLUS, you can enter the symbol PU as the base address. The offset address is the first location to be patched relative to the specified base. For example, a PRINT USING patch may begin at an offset of 100 octal bytes from the beginning of PRINT USING.

Responses to the BASE ADDRESS? and OFFSET ADDRESS? queries can be numbers or expressions. Valid octal numbers are 0 to 177777, and leading zeros are optional. Valid decimal numbers are 0. to 65535., and are distinguished from octal numbers by the presence of a trailing decimal point. When patching a SIL, you can substitute a global symbol name for an octal number anywhere. The load map for the module being patched is part of the SIL file. It contains that module's global symbol names and their values. A global symbol name must be one to six alphanumeric characters and must be defined in the symbol table for the current module. To refer to a global symbol in another module of the current SIL, type the symbol name followed by a commercial 'at' sign (@) and the name of the module in which the symbol is defined. For example, LOGIN@BASIC and DISK@ERR refer to the symbols LOGIN and DISK in the modules BASIC and ERR, respectively. An expression consists of one or more numbers or global symbols, separated by arithmetic operators (+, -, *, and /). Parentheses can be used to group portions of an expression.

After you specify the base and offset addresses, PATCH opens the specified locations, prints the old contents, and accepts input. Table 3-5 summarizes the possible input.

Table 3-5
Possible Input to the PATCH Option

Input	Meaning
number, symbol, or expression	Enter the number, symbol, or expression as the new contents of the current location.
LINE FEED	Advance to the next location without altering the contents of the current location.
^ (circumflex)	Return to the previous location without altering the contents of the current location.
CTRL/Z	Return to the previous question.
CTRL/C	Finish all patching and return to the OPTION: prompt.

PATCH makes the specified changes immediately after you press the RETURN key. Therefore, if you make an error, you must patch the location again to correct your mistake. To check that an entire patch is correct, use CTRL/Z to return to the OFFSET ADDRESS? query. Type the same offset, then press the LINE FEED key to examine all the patched locations. If the old contents listed for any location do not match the published patch, restore all locations to their original contents and try again to install the patch. If you have followed the published procedures correctly and the old contents do not match the published patch, consult your software support representative. The above procedure describes the PATCH option in detail. In general, however, published patches include the necessary instructions.

If you patch the initialization code, you must rebootstrap the system. Rebootstrapping loads the changed version of the initialization code into memory. To perform the bootstrap procedure, follow the instructions in the published patch and use the BOOT option, which is described in Section 3.11.

The examples in the following sections illustrate the use of PATCH.

3.4.2 Patching the Monitor – Example

The following example shows the procedure for patching the installed monitor SIL. The patch in the example is a sample only, NOT a real patch.

```
a  Option: PATCH
b  File to patch? (LF)
c  Module name? OVR
d  Base address? DLNOST
e  Offset address? 300
     Base    Offset   Old      New?
f  032000   000300   006200   ? 4737
g  032000   000302   032711   ? PATCH+10
h  032000   000304   040000   ? ^C
```

```
Option: PATCH
File to patch? <LF>
Module name? RSTS
Base address? PATCH
Offset address? 10
 Base    Offset  Old      New?
023136  000010  000000  ? 6200
023136  000012  000000  ? 32711
023136  000014  000000  ? 40000
023136  000016  000000  ? 207
023136  000020  000000  ? ^C

Option:
```

i

At line a, the user specifies the PATCH option and (at b) presses the LINE FEED key to patch the installed monitor SIL. He specifies the module OVR (line c) in response to the MODULE NAME? question and types the global symbol name DLN0ST to specify the base address (line d). The location to patch is offset 300 octal bytes from the base name DLN0ST, as indicated by the response at e. At lines f and g, the user types in the new values. Line g shows the use of addition in an expression. At h, the user types CTRL/C to exit from the PATCH option. The second use of the PATCH option (at i) continues the installation of this patch.

3.4.3 Patching the Initialization Code – Example

The following example shows the procedure for patching the initialization code. The patch in the example is a sample only, NOT a real patch.

```
a   Option: PATCH
b   File to patch? INIT.SYS
c   Base address? 26:117002
d   Offset address? 0
     Base    Offset  Old      New?
    117002  000000  016700  ? 4737
    117002  000002  177672  ? 104260
e   117002  000004  042705  ? ^Z
    Offset address? ^Z
    Base address? 104260
    Offset address? 0
     Base    Offset  Old      New?
    104260  000000  000000  ? 22127
    104260  000002  000000  ? 40
    104260  000004  000000  ? 17375
    104260  000006  000000  ? 105711
    104260  000010  000000  ? 261
    104260  000012  000000  ? 207
f   104260  000014  000000  ? ^Z
    Offset address? 0
     Base    Offset  Old      New?
    104260  000000  022127  ? <LF>
    104260  000002  000040  ? <LF>
g   104260  000004  017375  ? <LF>
    104260  000006  105711  ? <LF>
    104260  000010  000261  ? <LF>
h   104260  000012  000207  ? ^C

    Option:
```

At line a, the user specifies the PATCH option. He types the file name INIT.SYS at b and the base address at c. The example in Section 3.4.2 specified the base as a simple address. The base address in this example (26:117002) is the combination of an address (117002) and a relative block number (the 26th octal block) within the file INIT.SYS. After specifying the base, the user types the offset address (at d) and begins to enter the patch. Note (at lines e and f) the use of CTRL/Z to return to the previous question. After entering the patch, the user presses the LINE FEED key to examine successive locations (at g) and ensure that the patch is properly installed. At h, the user types CTRL/C to finish patching and return to the OPTION: prompt.

3.4.4 PATCH Option Error Messages

Table 3-6 summarizes the error messages that can occur during the PATCH option dialogue.

Table 3-6
PATCH Option Dialogue Error Messages

Message	Meaning
ADDRESS ABOVE MODULE BOUNDS	The address you specified is above the bounds of the module.
ADDRESS BELOW MODULE BOUNDS	The address you specified is below the bounds of the module.
BLOCK OFFSET BEYOND EOF	The block offset address you typed is greater than or equal to the number of blocks in the file.
FILE NOT FOUND	The initialization code did not find the file you specified in account [0,1] on the system disk.
ILLEGAL FILE NAME	The filename you typed is in an incorrect format. The name must be no more than six characters long; the extension must be no more than three characters long. The filename must be alphanumeric and can contain no embedded spaces. Typing the LINE FEED key in response is illegal if no monitor SIL is installed.
INVALID MODULE NAME	The module name you typed is in an incorrect format. The name must be one to six alphanumeric characters.
INVALID CHARACTER	The expression line contains an illegal character.
INVALID EXPRESSION	The expression contains an illegal symbol name or an invalid operator. Symbol names must be one to six alphanumeric characters. Valid operators are +, -, *, and /.
INVALID SIL FORMAT	The file you specified does not contain a valid SIL directory. If the file is not a SIL, append the /N switch to the filename.
MODULE NOT FOUND IN SIL	The module you specified is not in the SIL. Press the RETURN key in response to the MODULE NAME query for a directory of SIL modules.
SYMBOL NOT FOUND IN STB	A symbol you typed is not in the symbol table for the module.

3.5 SPECIFYING THE HARDWARE CONFIGURATION

With the HARDWR option, you can list the hardware configuration, declare nonstandard controller addresses and vector assignments, and disable device controllers. The option operates whether or not you have installed a monitor SIL because the settings it affects are written on the system disk, not in the monitor SIL. Thus, when you change system devices you must use the HARDWR option again. If you only change monitors, you need not use the option. The HARDWR option is intended mainly as a diagnostic aid for DIGITAL field service engineers.

The HARDWR option includes a set of suboptions, which are summarized in Table 3-7.

Table 3-7
HARDWR Suboptions

Suboption	Function
LIST	List the system hardware configuration
DISABLE	Disable a device controller
ENABLE	Enable a device controller
CSR	Declare a nonstandard controller address
VECTOR	Declare a nonstandard vector assignment
RESET	Set all vectors and addresses to the standard and enable all devices
DM	Declare DM11-BB and DH11 associations

The LIST suboption lists the current configuration and all requested changes.

The ENABLE and DISABLE suboptions allow you to enable or disable a device controller, not just a single unit. By disabling the RK611 (RM) controller, for example, you disable all RK06 disk units. To disable or enable devices on a unit-by-unit basis, see Section 3.9.

The CSR suboption enables you to set nonstandard values for a device controller's CSR set. The CSR set is the unique set of addresses on the UNIBUS to which a device controller responds. When the initialization code is bootstrapped, it ascertains the number of each type of controller on the system by applying standard rules for finding CSR sets. DIGITAL Field Service representatives follow these rules when they install systems; thus, you probably will not need to use the CSR suboption.

With the VECTOR suboption, you can specify a non-standard vector for any device controller. A controller vector assignment directs the processor to the proper routines when that controller requests an interrupt. When you bootstrap the system, the initialization code ascertains each device controller's vector assignment by forcing each device to interrupt. If a device does not respond, the initialization code disables it and prints a message at the console terminal. If more than one device has the same vector assignment, the initialization code disables all except the first one it finds. You probably will not need to use the VECTOR suboption because the vector assignments are normally standard.

The RESET suboption returns all CSR sets and vector assignments to the standards, enables all devices, and associates each DM11-BB unit with the DH11 multiplexer that has the same unit number.

The DM suboption allows you to specify the DM11-BB modem control multiplexer that is associated with each DH11 terminal multiplexer.

To use the HARDWR option, type HARDWR or HA. In response, the option requests a suboption name. Type the name of a suboption from Table 3-7. You need type only the first two characters. HARDWR then performs the dialogue (if any) for the suboption you selected. If you make any changes to the controller characteristics, HARDWR does not effect them immediately, but instead applies them when it bootstraps the system disk (when you exit from the HARDWR option). Thus, you can examine and verify the changes before the option applies them. If you have made any errors, you can correct them before HARDWR applies them.

After you verify the changes specified with all suboptions, type EXIT or the LINE FEED key in response to the HARDWR SUBOPTION? query. HARDWR effects the changes, bootstraps the system disk, and prints the message:

nn CHANGES BEING MADE

REBOOTING . . .

In the message, nn is the number of changes that HARDWR applies.

To exit from the HARDWR option without applying any changes, type CTRL/C. CTRL/C returns to the OPTION: query.

Queries in the DISABLE, ENABLE, CSR, and VECTOR suboptions request the name of a controller. To get a list of valid controller names, type a question mark (?) in response to the query. The suboption responds with the following list:

```
Name  Max no  Description

 TT      1     Console terminal
 RC      1     RC11 fixed head disk
 RF      1     RF11 fixed head disk
 RS      1     RS03/RS04 fixed head disk
 RK      1     RK05/RK05F disk
 RM      1     RK06 disk
 RP      1     RP02/RP03 disk
 RB      1     RP04/RP05/RP06 disk
 TM      1     TU10/TS03 magtape
 TU      1     TU16/TU45 magtape
 TC      1     TC11 DECtape
 PR      8     Paper tape reader
 PP      8     Paper tape punch
 LP      8     Line printer
 RX      4     RX11 floppy disk
 CR      8     CR11/CM11 card reader
 CD      8     CD11 card reader
 KL     16     KL11/DL11A/DL11B single line interface
 DL     31     DL11C/DL11D single line interface
 DE     31     DL11E single line interface
 DP     32     DP11 synchronous line interface
 DC     32     DC11 single line modem interface
 KG      8     KG11 CRC arithmetic unit
 DM     16     DM11-BB modem control for DH11
```

```
DJ    16     DJ11 16 line multiplexer
DH    16     DH11 16 line multiplexer
DU    16     DU11 single line synchronous interface
DI    16     DUP11 single line synchronous interface
XM    16     DMC11 interprocessor link
DZ     8     DZ11 8 line multiplexer
```

The first column contains the controller names. The second column, Max no, is the maximum number of each type of controller that can be connected to a PDP-11. The final column describes the controller.

Your reply to a request for a controller name should be a 2-character controller name followed by the number of the controller you plan to change. Controllers, like device units, are numbered from 0 to 1 less than the maximum possible number of controllers. You can omit a controller number of 0 if only one such controller is possible. For example, RK and RK0 are equivalent because a PDP-11 can have only one RK05 controller. On the other hand, LP and LP0 are not equivalent. LP0 designates line printer controller number 0; LP is invalid because more than one line printer controller can be on the system.

To exit from a suboption without specifying a controller name, type CTRL/Z in response to the query.

Controller characteristics set by the HARDWR option remain with the disk device rather than with the RSTS/E monitor. Therefore, when you install a different monitor on the same system disk, you need not reset the device controller characteristics. If you create and bootstrap a new system disk, however, the initialization code sets all controller characteristics to the standards. You will then need to use the HARDWR option to set nonstandard characteristics if necessary.

3.5.1 Listing the Hardware Configuration

The LIST suboption lists the current hardware configuration table, including all changes that HARDWR will apply when you exit from the option. The following is a sample listing:

```
        HARDWR suboption? LI

        1 change pending.

        Name   Address  Vector  Comments
line a  TT:     177560    060
        RS:     172040    204   Units: 0(RS04)
        RK:     177400    220   RK05F units: none
        RB:     176700    254   Units: 0
        TU:     172440    224
        TC:     177340    214
        LP0:    177514    200
line c (LP0:    System            Disabled)
        DL0:    175610    310
        DL1:    175620    320
        DL2:    175630    330
        DL3:    175640    340
```

```
line b   KG0:                          Disabled
         DM0:     170500     474      DH0
         DH0:    *160100    *500
         DH1:    *160120    *510
         DU0:     160060     400

         HARDWR suboption?
```

The top line lists the number of changes that HARDWR will enact (changes that are currently pending) when you exit from the option. If no changes are pending, the LIST suboption omits this line.

Next is the table itself. It contains one line for each device controller that actually exists on the system. (See line a.) The table also contains a line for controllers that are currently either disabled or nonexistent. This type of line is shown at b.

The table contains an additional line (in parentheses) at c for each controller that has changes pending. This line is present whether or not the controller has a listing line like that at a. Thus, if you declare nonstandard characteristics for a controller that does not yet exist on the system, HARDWR prints a parenthetical change line noting the changes.

Each line is divided into four columns. The first column contains the name and number of the device controller. The second column for a line like that at a includes the address of the controller's CSR set. The third column contains the controller's vector address. (If the device has two vectors, HARDWR prints the lower address.) An asterisk (*) precedes a CSR or vector address that is nonstandard.

In a parenthetical change line, the Address column contains either a nonstandard address or the notation SYSTEM. The notation SYSTEM means that the initialization code will find the CSR set according to the standard fixed and floating address rules when it bootstraps the system disk. (See Appendix F for a discussion of fixed and floating address rules.) The third column in a change line is blank or contains a nonstandard vector address that you specified.

The fourth column, for any line, supplies information about the controller. Table 3-8 summarizes the comments that may be in the listing for each controller.

Table 3-8
Possible Comments in the Configuration Listing

Device	Comment	Meaning
All	Disabled	Device is (or will be) disabled.
All	Not Found	Device has a nonstandard CSR set that did not respond when you last bootstrapped the system.
RC, RF	n platters	n is the number of disk platters present.
RS	units: m . . . t	m through t are the unit numbers of drives that exist on the controller. (Note that 8 units are possible.) The notation (RS04) appears after unit numbers of RS04 drives.
RP	RP03 units: m . . . t	m through t are unit numbers of RP03 disks. (Note that 8 units are possible.) Unit numbers of RP02 drives are not listed.

Table 3-8 (Cont.)
Possible Comments in the Configuration Listing

Device	Comment	Meaning
RB	Units: m . . . t	m through t are unit numbers of drives that exist on the controller. (Note that 8 units are possible.) The notation (RP06) appears after unit numbers of RP06 drives.
DM	DHn	DH11 controller number n is logically associated with this DM11-BB unit.
	No DH11	No DH11 controller is logically associated with this DM11-BB unit.
RK	RK05F units: n/m	n and m are the even and odd unit numbers of the RK05F drive.
	RK05F units: none	No RK05F units are on the system.

3.5.2 Disabling a Device Controller

The DISABLE suboption allows you to make a device controller unavailable for timesharing use. This suboption has two possible uses: (1) to disable a controller that needs repairs, and (2) to disable an erroneously detected controller. In certain circumstances, the initialization code interprets a nonstandard device as a normal PDP-11 device, and therefore enables the standard PDP-11 device. With the DISABLE suboption, you can disable the nonexistent PDP-11 device.

The following is a sample use of the DISABLE suboption:

```
HARDWR suboption? DIS

  Controller to disable? DM0

HARDWR suboption? LIST

2 changes pending.

Name  Address Vector  Comments
TT:    177560   060
RF:    177460   204   2 platters
RK:    177400   220   RK05F units: none
RP:    176700   254   RP03 units: 0 1
TM:    172520   224
TC:    177340   214
PR0:   177550   070
PP0:   177554   074
LP0:   177514   200
DP0:                  Disabled
(DP0:  System)
DM0:   170500   300   DH0
(DM0:  System         Disabled)
DH0:   160020   310

HARDWR suboption?
```

In the example, the user specifies DM0 as the device controller to disable. The initialization code executes the DISABLE suboption and returns to the HARDWR SUBOPTION? query. The user then uses the LIST suboption to verify that DM0 will be disabled when he exits from the HARDWR option.

3.5.3 Enabling a Controller

Use the ENABLE suboption to reenable a disabled controller. The following example illustrates the use of the ENABLE suboption:

```
HARDWR suboption? ENABLE

  Controller to enable? DP0

HARDWR suboption? LIST

1 change pending.

Name   Address  Vector   Comments
TT:     177560    060
RF:     177460    204    2 platters
RK:     177400    220    RK05F units: none
RP:     176700    254    RP03 units: 0 1
TM:     172520    224
TC:     177340    214
PR0:    177550    070
PP0:    177554    074
LP0:    177514    200
DP0:                     Disabled
(DP0:   System)
DM0:    170500    300    DH0
DH0:    160020    310

HARDWR suboption?
```

The user in the example enables the DP0 controller. When the initialization code returns to the HARDWR SUBOPTION? query, the user lists the hardware configuration to verify the change.

3.5.4 Declaring a Nonstandard Controller Address

The CSR suboption allows you to specify a nonstandard address for a device controller's CSR set. Use the CSR suboption when a controller is installed at the wrong place or when you need to rearrange device controller assignments.

To invoke the CSR suboption, type CSR. The suboption responds by requesting a controller name and address. In response, type the controller name as described in Section 3.5. When the CSR suboption prints the query, type the address of the lowest register in the controller's CSR set. The address must be an even 6-digit octal number greater than 160000. To remove a nonstandard address and revert to the standard, type RE or REMOVE in response to the prompt.

To return to the HARDWR SUBOPTION? query without specifying a new address, type CTRL/Z.

The following example shows the use of the CSR suboption:

```
HARDWR suboption? CSR

  Controller with non-standard address? DH0
  New controller address? 160100

HARDWR suboption? LI

1 change pending.

Name   Address  Vector   Comments
TT:     177560    060
RS:     172040    204    Units: 0(RS04)
RK:     177400    220    RK05F units: none
RB:     176700    254    Units: 0
TU:     172440    224
TC:     177340    214
LP0:    177514    200
DL0:    175610    310
DL1:    175620    320
DL2:    175630    330
DL3:    175640    340
KG0:    170700
DM0:    170500    474    DH0
(DH0:  *160100)
DU0:    160060    400

HARDWR suboption?
```

In this example, the user requests the CSR suboption. He types DH0 as the controller and specifies a new address of 160100. He then uses the LIST suboption to verify the change.

3.5.5 Declaring a Nonstandard Vector Address

The VECTOR suboption permits you to specify a nonstandard vector address for a device controller. Use VECTOR if the initialization code incorrectly determines a controller's vector address or if the hardware configuration includes more than one floppy disk controller or card reader.

VECTOR requests the device controller's name and its new vector address. Type the name as described in Section 3.5. The vector address is the 3-digit octal address of the lowest vector for the device controller. The address must be even. To remove a nonstandard vector address and return to the standard, type RE or REMOVE. Type CTRL/Z to return to the HARDWR SUBOPTION? question without specifying a new vector address.

The following is an example of the VECTOR suboption:

```
HARDWR suboption? VEC

  Controller with non-standard vector? DH0
  New vector address? 500

HARDWR suboption? LI

1 change pending.
```

```
Name   Address  Vector   Comments
TT:     177560    060
RS:     172040    204    Units: 0(RS04)
RK:     177400    220    RK05F units: none
RB:     176700    254    Units: 0
TU:     172440    224
TC:     177340    214
LP0:    177514    200
DL0:    175610    310
DL1:    175620    320
DL2:    175630    330
DL3:    175640    340
KG0:    170700
DM0:    170500    474    DH0
(DH0:  *160100   *500)
DU0:    160060    400

HARDWR suboption?
```

The user in this example has already set a nonstandard controller address for DH0. He now sets a nonstandard vector address for DH0. In response to the NEW VECTOR ADDRESS? query, he types 500. He then lists the configuration to verify the vector address.

3.5.6 Resetting the Configuration

The RESET suboption sets all device characteristics to the standards. It removes all nonstandard CSR sets and vector addresses and enables all devices. The following example shows the effects of the RESET suboption.

```
HARDWR suboption? LIST

3 changes pending.

Name   Address  Vector   Comments
TT:     177560    060
RF:     177460    204    2 platters
RK:     177400    220    RK05F units: none
RP:     176700    254    RP03 units: 0 1
TM:     172520    224
(TM:    System   *226)
TC:     177340    214
PR0:    177550    070
(PR0:  *160002)
PP0:    177554    074
LP0:    177514    200
DP0:                     Disabled
(DP0:   System)
DM0:    170500    300    DH0
DH0:    160020    310

HARDWR suboption? RESET

HARDWR suboption? LIST
```

```
1 change pending.

Name   Address  Vector   Comments
TT:     177560    060
RF:     177460    204    2 platters
RK:     177400    220    RK05F units: none
RP:     176700    254    RP03 units: 0 1
TM:     172520    224
TC:     177340    214
PR0:    177550    070
PP0:    177554    074
LP0:    177514    200
DP0:                     Disabled
(DP0:   System)
DM0:    170500    300    DH0
DH0:    160020    310

HARDWR suboption?
```

For the purposes of this example, the LIST suboption is used before and after the RESET suboption to show the effects of resetting the configuration. The first listing shows that two devices (TM: and PR0:) will have nonstandard addresses and vectors set when the user exits from the HARDWR option. A third device, DP0:, is disabled and will be enabled with a standard address and vector. After the use of the RESET suboption, the listing shows that TM: and PR0: have returned to standard characteristics. Note that the listing for DP0: did not change because DP0: was already designated to be enabled with standard characteristics.

3.5.7 Declaring DM11-BB and DH11 Associations

The DM suboption allows you to specify the DM11-BB modem control multiplexer that is associated with each DH11 terminal interface multiplexer. The DH11 terminal interface multiplexer has 16 lines (which are numbered from 0 to 15), any number of which can be modem lines. A PDP-11 can have up to 16 DH11s. The DM11-BB modem control multiplexer also has 16 lines. Each line can answer one modem line on a DH11. A PDP-11 can have only as many DM11-BBs as DH11s.

DM11-BB modem control lines and DH11 modem lines must meet the following conditions under RSTS/E:

1. A DM11-BB can answer modem lines on only one DH11.
2. A DH11 can be associated with only one DM11-BB.
3. The line numbers of the DH11 modem line and its associated DM11-BB line must be the same. For example, a DM11-BB line number 4 can control only a DH11 modem line number 4.

The RSTS/E software cannot ascertain the DM11-BB unit that is associated with a DH11. Therefore, RSTS/E assumes that DM11-BB unit number 0 controls modem lines on DH11 unit number 0, and so forth. On most systems, the unit numbers are equal. RSTS/E does not, however, require that DH11 and DM11-BB unit numbers be equal. Thus, DM11-BB unit number 2 can control modem lines on DH11 unit number 4, as long as the preceding rules are followed.

The DM suboption allows you to specify the DM11-BB unit that is associated with each DH11 on the system. The suboption requests the DM11-BB unit number in the following prompt:

```
DH FOR DMn (xxx)?
```

In response, type the number of the DH11 unit with which DM11-BB unit number n is associated or press the LINE FEED key to accept the current setting, which appears in parentheses. If no DH11 is currently associated with the DM11-BB, a question mark (?) appears in parentheses. If DM11-BB unit n is not on the system, the notation NX (for nonexistent) appears in parentheses. HARDWR requests DH11 unit numbers for all 16 possible DM11-BB units whether or not the system includes 16 units. Therefore, you can logically associate a DH11 unit with a DM11-BB that is not yet on the system, but is expected in the future. You need not specify associations for nonexistent DM11-BBs; you can type CTRL/Z at any time to return to the HARDWR SUBOPTION? query. Note, however, that CTRL/Z causes the system to make no associations for the remaining DM11-BB units, and cancels the assumption that DHn is associated with DMn.

The following is an example of DM:

```
HARDWR suboption? DM
  DH for DM0 (0)? LF
  DH for DM1 (1, NX)? ^Z

HARDWR suboption?
```

In the example, the user associates DH0 with DM0. He makes no more associations because the system includes only 1 DH11 and 1 DM11-BB.

3.5.8 HARDWR Option Error Messages

Table 3-9 summarizes the error messages that can occur during the dialogue of the HARDWR option.

Table 3-9
HARDWR Option Error Messages

Message	Suboption	Meaning
ADDRESS MUST BE AN EVEN OCTAL NUMBER GREATER THAN 160000.	CSR	You specified an invalid address. Type an address that meets the requirements.
CONTROLLER ALREADY DISABLED	DISABLE	You tried to disable a disabled controller.
CONTROLLER NOT DISABLED	ENABLE	You tried to enable an enabled controller.
CONTROLLER NUMBER MISSING	DISABLE, ENABLE, CSR, VECTOR	You did not specify a controller number for a device that has multiple controllers.
CONTROLLER NUMBER MUST BE LESS THAN nn	DISABLE, ENABLE, CSR, VECTOR	The controller number you typed is larger than the maximum of nn.
DH11 ALREADY ASSIGNED TO A DM11-BB	DM	The DH11 unit you specified is already assigned to a DM11-BB.
INVALID CONTROLLER NAME	DISABLE, ENABLE, CSR, VECTOR	The first two characters you typed did not name a valid device controller. Type ? to obtain a list of valid controller names and try again.
INVALID CONTROLLER NUMBER	DISABLE, ENABLE, CSR, VECTOR	The controller number you typed is not an integer. Type the number in the correct format.
INVALID RESPONSE	DM	The unit number you specified is not a decimal number from 0 to 15.
VECTOR MUST BE AN EVEN OCTAL NUMBER LESS THAN 1000.	VECTOR	You specified an invalid address. Type an address that meets the requirements.

3.6 INSTALLING A MONITOR

Use the INSTALL option to designate the monitor SIL that you will use for timesharing. You can use INSTALL to change to a different monitor any time the initialization code is running. Therefore, you can retain more than one monitor on one system disk. After installing a newly generated monitor, you must use the DEFAULT option to set defaults for that monitor. The monitor that you install in this step is the default monitor for all operations until you use the INSTALL option again to install another monitor SIL. When you are generating a SYSGEN system, the name of the monitor you should install is SYSGEN. When you are generating a target system, the monitor has the name you specified during the configuration questions. An example of the use of the INSTALL option follows:

```
Option: INSTALL

  SIL? SYSGEN


Option:
```

The INSTALL option prompts you for the name of the monitor SIL to install. It then performs consistency checks on the specified SIL. Execution of the INSTALL option takes about 30 seconds. Table 3-10 contains the error messages that can appear when you respond to the prompt.

Table 3-10
INSTALL Option Dialogue Error Messages

Message	Meaning
FILE NOT FOUND	The installation code did not find the file that you specified on the system disk in account [0,1].
ILLEGAL FILE NAME	The file name you typed is not one to six alphanumeric characters.
INVALID SIL FORMAT	The file you specified does not have a valid SIL index block.

After you type a valid response, the option ascertains that the SIL you named contains all the necessary modules. If a module is missing or in an incorrect format, the INSTALL option prints an error message and returns to the OPTION: prompt. These error messages are explained in Appendix B.

If a monitor SIL file is already installed, the INSTALL option turns off certain bits (in the [0,1] directory entry for that file) so that you can delete the monitor file (and its default RTS and ERR files, if any). Next, for both a change of monitor and an entirely new system, the option turns on the proper bits to install the monitor SIL and records its name for use by the initialization code. Finally, the option records any defaults that are already set for the newly installed monitor. The installation is then complete.

3.7 CHANGING SYSTEM FILE ALLOCATION

You can 1) list file status, 2) change system file allocation, 3) create and delete files in account [0,1], and 4) examine and update the bad block file with the REFRESH option. REFRESH operates only on disks that have been initialized with the DSKINT option (see Section 3.2). The REFRESH option also includes a CLEAN facility, which rebuilds a disk's storage allocation table (SATT.SYS) and checks the consistency of directories.

If you are generating the first RSTS/E system on the current system disk, you must use REFRESH to create the required swapping file SWAP.SYS. REFRESH also creates additional swapping files, CRASH.SYS, OVR.SYS, ERR.SYS, and BUFF.SYS (which is required if the system will support DECtape). It allows you to position these files at specific places on a disk. File positioning and creation (except SWAP.SYS) are optional operations that can increase system speed and efficiency.

Once you have generated a system, use the REFRESH option when system files need changes. For example, REFRESH permits you to add bad blocks to the bad block file on any disk. If you discover bad blocks, use REFRESH to allocate them to the bad block file.

REFRESH can also allocate file space on auxiliary disks. For example, you can use REFRESH to allocate swapping space on an auxiliary disk (usually a fixed head disk). The REFRESH option can also allocate OVR.SYS and ERR.SYS files on auxiliary disks.

3.7.1 Planning System Files

Before you use the REFRESH option, you should plan which files to include in the system, how large to make them, and where to place them. REFRESH allows you to create the following files:

- Swapping files – SWAP.SYS, SWAP0.SYS, SWAP1.SYS, SWAP3.SYS (SWAP2.SYS does not exist.)
- OVR.SYS
- ERR.SYS
- BUFF.SYS
- CRASH.SYS

If the SYSGEN and target systems will be on the same (moving head) disk[1], you can allocate all system files that you will need later for the target system while you are tailoring the SYSGEN system. For example, you can allocate a SWAP.SYS file on the system disk at the size needed for the target system instead of the minimal size file that the SYSGEN system requires. If you plan to use a fixed head disk for swapping files, the overlay code, and error message file, you can also REFRESH it while you are tailoring the SYSGEN system. If you allocate the files for the target system when you tailor the SYSGEN system, you need not allocate them again after you install the target monitor. You should use the REFRESH option after installing the target monitor to list the file status table (Section 3.7.3) and ensure that the files are correctly allocated. Note that you need not allocate the target system files when you tailor the SYSGEN system; you can allocate them after you install the target monitor if you prefer.

If the SYSGEN and target systems will be on different disks (or if the target system will overwrite the SYSGEN system on a fixed head disk), you should not allocate target system files while tailoring the SYSGEN system. When you use REFRESH in tailoring the SYSGEN system, create only the minimal files necessary for system generation – SWAP.SYS (at 208 blocks for a 48K word system and 224 blocks for all other systems) and BUFF.SYS (which is required if you need to use DECtape under the SYSGEN system). You can allocate target system files later when you tailor the target system (described in Chapter 5).

[1] DIGITAL recommends this method only for large, moving head disks of the DM, DP, or DB type.

3.7.1.1 Planning the Swapping Files – The most important and time-consuming of the planning processes involves planning the swapping files. You must answer the following three questions to properly plan the swapping files:

1. How many swapping files does this system need?
2. Where should the swapping files be placed?
3. How large should each swapping file be?

The cardinal rule for planning swapping files is to anticipate future growth. If you suspect that the system will someday require a larger swap maximum or job maximum than it currently requires, you should allocate enough swapping space to serve your future needs. You should try to reserve this space now because swapping files require contiguous space on a disk. Although you can create contiguous swapping files during timesharing (with the contiguous mode bit in an OPEN statement), DIGITAL does not recommend this procedure. Once many files have been allocated on a disk, space on that disk becomes fragmented. This fragmentation may cause difficulty in allocating contiguous swapping files of sufficient length. Furthermore, if you allocate extra contiguous swapping space, but expected growth does not occur, you can simply release the space for other use.

RSTS/E can use swapping space in one to four swapping slots, numbered from 0 to 3. Swap slot 2 is permanently assigned to the file SWAP.SYS on the system disk. The other swapping slots (0, 1, and 3) can be associated with swapping files or non-file-structured disks. You can specify these associations on-line by using the UTILTY program or the INIT.BAC system program. When you associate swapping files with swapping slots, DIGITAL recommends that you use SWAP0.SYS for swap slot 0, SWAP1.SYS for swap slot 1, and SWAP3.SYS for swap slot 3. This manual follows that naming convention.

In allocating swapping space, you should consider the way in which the system is used and the number of event-driven jobs on the system. (Event-driven jobs are not run unless a particular event occurs. Events that cause these jobs to be run are the end of a SLEEP or hibernation state, and the reception of a message.)

The system scans the swap slots whenever it needs to swap a job out of memory. The system places event-driven jobs in the first swap slot with available space that it finds during a "bottom up" scan (from swap slot 3 to swap slot 0). Since these jobs do not require frequent swapping, they can be swapped onto a moving head disk without noticeably degrading performance. The system performs a "top down" scan (swap slot 0 to swap slot 3) when it swaps out a highly interactive job (one requiring frequent processor intervention). Whenever possible, highly interactive jobs should be swapped to the fastest area available. Figure 3-1 illustrates the swap slot scanning procedures.

You should also consider the system's disk configuration. If the system has only one disk, you need only create the one required swapping file, SWAP.SYS, on that disk. The file should be at least large enough to hold a number of jobs equal to the default job maximum.

For a system with more than one disk, planning swapping files is more complicated. You need to choose the disk or disks on which to place the swapping files and calculate the size of each file.

First, consider a system with both moving head and fixed head disks. Assume that the system disk is a moving head device. Unless you need the speed of access on the fixed head disk for other files (such as a frequently accessed database index), you should place all swapping files (except SWAP.SYS, which must be on the system disk) on a fixed head disk. If you can spare an entire fixed head disk, you can use it non-file-structured as a single swapping unit. To do so, you should first use the DSKINT option to check the disk for bad blocks. If the disk contains no bad blocks, you need not use REFRESH on it; you can simply use INIT.BAC at start-up time to install it as a swapping unit. (Refer to Chapter 3 of the RSTS/E System Manager's Guide for a discussion of INIT.BAC.) Once you install it, RSTS/E can use the disk only as a swapping unit. Remember that a swapping file can extend across platter boundaries on a DF or DC disk, but cannot extend across disk unit boundaries for other fixed head disks.

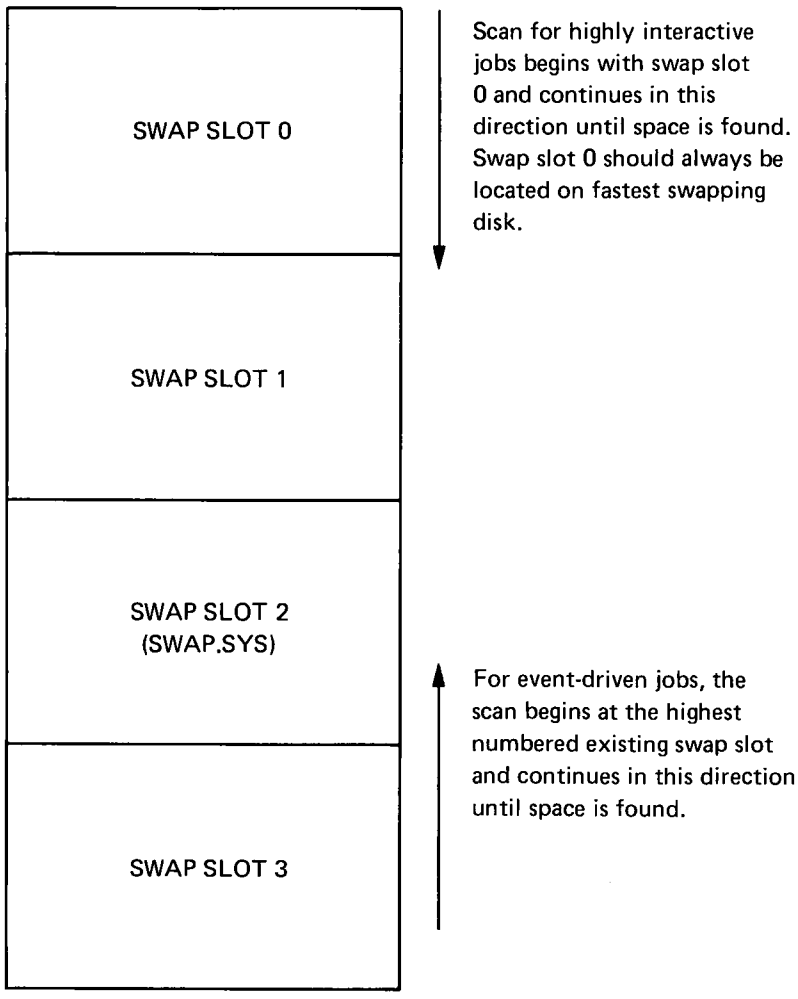
SWAP SLOT 0
SWAP SLOT 1
SWAP SLOT 2
(SWAP.SYS)
SWAP SLOT 3
Scan for highly interactive jobs begins with swap slot 0 and continues in this direction until space is found. Swap slot 0 should always be located on fastest swapping disk.
For event-driven jobs, the scan begins at the highest numbered existing swap slot and continues in this direction until space is found.

Figure 3-1 Swap Slot Scanning

DIGITAL recommends that, if at all possible, you place the files OVR.SYS and ERR.SYS on an initialized fixed head disk to increase system performance. You can then use the remaining space on the disk for swapping.

If the fixed head disk contains bad blocks, you can use it only as a file-structured unit. Use REFRESH to set up a swapping file on the disk. You can place other files on the disk if enough space remains. Note that the file SWAP.SYS must reside on the system disk and must be large enough for at least two jobs at size SWAP MAX. (The system requires this file as a place to swap a job when timesharing begins but before the other swapping files are installed.) Therefore, for a system that will swap all jobs onto a single fixed head disk, you must create two swapping areas: SWAP.SYS (which can be of minimal size) on the system disk, and SWAP0.SYS (which should be large enough to hold the default maximum number of jobs at size SWAP MAX) on the auxiliary fixed head disk.

If you cannot place all swapping files on a fixed head disk, you should consider the average number of jobs that will run on the system. If the system usually runs near the default job maximum, you should allocate as large a swapping space as possible on a fixed head disk. Name this file SWAP0.SYS if the fixed head disk is a nonsystem disk or SWAP.SYS if the fixed head disk is the system disk. The system will swap highly interactive jobs into this file. You should also allocate a swapping file on a moving head disk. This file should have a high number (SWAP3.SYS if on a nonsystem moving head disk or SWAP.SYS if on a moving head system disk) so that the system will swap event-driven jobs into it.

Some systems usually run below the default job maximum with approximately the number of jobs that fit into a swapping file on a fixed-head disk. For such a system, you should first estimate the number of jobs that are inactive at any one time. Inactive jobs usually include ERRCPY, QUEMAN, OPSER, spoolers, and similar programs. Then, estimate the amount of swapping space necessary to accommodate any jobs over those that will fit on the fixed head disk up to the default job maximum. For example, if approximately 18 jobs usually run on the system (and will fit on the fixed head disk), but the default job maximum is 25, calculate the amount of space necessary to accommodate the extra 7 jobs. (The seven jobs require 7 times the SWAP MAX multiplied by 4 blocks. Four blocks equal 1024, or 1K words.) For this system, you should allocate three swapping files. SWAP0.SYS, on a fixed head disk, should be large enough to hold the highly interactive jobs. SWAP3.SYS, also on a fixed head disk, should be able to hold the event-driven jobs. SWAP.SYS, on the moving head system disk, can accommodate any jobs that do not fit onto the fixed head disk.

If your system has more than one moving head disk and no fixed head disk space is available for swapping files, you need to consider one more possibility. If you are certain that two disks will always be mounted, you can create one swap file on each of two disks instead of creating one larger file on only one disk. Make the two files equal in size. This arrangement reduces access time for moving head disks because it uses the overlapped seek drivers efficiently. If, however, one of the disk drives becomes unavailable for use during timesharing, the system limits the maximum number of jobs that can log in. RSTS/E logs in only as many jobs as the existing swapping files can accommodate. You can run the system with a reduced job maximum, or you can try to allocate additional swapping space on another disk.

Now, consider the question of size. A swapping file must be (4 times SWAP MAX) blocks long to hold one job of size SWAP MAX. Thus, the total swapping space required on a system is (JOB MAX multiplied by 4 times SWAP MAX). Each swapping file holds an integral number of jobs, N, where

$$N = \frac{\text{Size of swapping file in blocks}}{\text{SWAP MAX} * 4} \quad \text{(truncated)}$$

Once you have decided how many jobs a particular swapping file needs to accommodate (N), simply calculate (N multiplied by SWAP MAX times 4) to determine the necessary size for each swapping file you plan to allocate. Appendix C contains a table of disk device sizes, which you may find useful in determining swapping file sizes.

3.7.1.2 Planning Optional System Files – To set up your system for optimal performance, you need to consider creation and placement of the additional contiguous system files BUFF.SYS, OVR.SYS, and ERR.SYS. If your system is configured for DECtape, you must create the file BUFF.SYS, which contains the DECtape buffers. This file must reside on the system disk and must contain at least three blocks for each DECtape unit on the system. If your system disk is a moving head device, you can group BUFF.SYS with other system files near the center of the occupied space on the disk for optimal performance. If your system disk is a fixed head disk, there is no need to specially place BUFF.SYS.

The files OVR.SYS and ERR.SYS perform no useful purpose on a fixed head system disk. Since the error messages and overlay code already reside on the fixed head system disk, placing them in separate files on the same fixed head disk does not improve performance and wastes disk space.

If your system disk is a moving head disk and the system hardware configuration includes a fixed head disk, you can improve system performance by creating separate files to hold the overlay code and error messages during timesharing. REFRESH allows you to create and position the files OVR.SYS and ERR.SYS for this code. You gain optimal system performance by placing these two files on a fixed head disk. Placing OVR.SYS and ERR.SYS on a fixed head disk should take precedence over allocating one extra swapping slot in a swapping file.

If space is not available on an auxiliary fixed head disk, group the files with other system files near the center of the occupied space on the system disk. This grouping can increase system performance by reducing average seek time for the disk heads.

3.7.1.3 Planning for the Crash Dump File – The final system file you need to plan is CRASH.SYS. First, decide whether to create it; second, determine its optimal size.

CRASH.SYS is optional, but if included, it must reside on the system disk. If you plan to enable the crash dump facility, you must create CRASH.SYS.

To ensure that you do not lose error information if the system crashes, DIGITAL recommends that you create CRASH.SYS and enable crash dumps. The following are the steps RSTS/E takes when a crash occurs.

1. The RSTS/E error handling code discovers an error from which it cannot recover.
2. RSTS/E dumps the contents of the read/write area of monitor memory into CRASH.SYS (if the file exists and the crash dump facility is enabled). Since the dump preserves the state of the system at the time of the crash, it contains essential diagnostic information.
3. RSTS/E then reloads the system from disk into memory and performs an auto-restart.

For example, assume that monitor error logging routines log a parity error within monitor memory. The system crashes because the monitor may be corrupt. Since the ERRCPY program cannot run to log the error, the error data (and probably the cause of the crash) are lost unless a crash dump is performed. Creating CRASH.SYS and enabling the crash dump facility would prevent this loss of error data.

Allocate enough space to CRASH.SYS so that it can hold the read/write area of the RSTS/E monitor. The read/write area of the monitor contains tables and data areas that change during timesharing. The size of the monitor read/write area depends on the system's hardware and software configuration, so it varies from system to system. It is usually 8K to 16K words (32 to 64 blocks).

To determine the size necessary for CRASH.SYS, examine the file status table printed by the LIST suboption. (See Section 3.7.3.) If your system disk is large, you can create CRASH.SYS at the maximum possible size (80 blocks). Allocating an 80 block CRASH.SYS file allows for future expansion and reserves additional contiguous disk space. Contiguous space may not be available after the disk has been heavily used. If your system disk is too small to allow you to allocate an 80 block CRASH.SYS file, try to allocate a file approximately eight to twelve blocks larger than the minimum required size. An extra eight to twelve blocks provides space for 2K to 3K monitor expansion. Of course, if you are certain that your system disk will not be used for an expanded monitor, you need not configure any extra space at all.

3.7.2 Using the REFRESH Option

To invoke REFRESH, type REFRESH or RE in response to the OPTION: prompt. The option responds by requesting date and time. After you specify the date and time, REFRESH asks you for the disk type and unit on which to allocate the files. Type a disk name or press the LINE FEED key to specify the system disk. If you do not press LINE FEED, the REFRESH option requests the unit number of the disk. After you specify the disk to use, REFRESH may ask whether to clean the disk. Table 3-11 summarizes these questions and the possible responses.

The cleaning operation, which repairs a corrupt file structure, performs the following steps:

1. It builds a new storage allocation table (SATT.SYS) that reflects all the files on the disk.
2. It scans all directories and deletes all files that have the extension .TMP or are marked for deletion.
3. It finds any doubly-allocated blocks and allows you to specify their correct allocation.
4. It finds and deletes all invalid directories.
5. It marks the disk as having a clean file structure.
6. It allows you to delete files that contain bad blocks.

Table 3-11
REFRESH Questions and Responses

Question	Response
DD-MMM-YY?	Type the date in DD-MMM-YY format, such as 25-APR-76, or press the LINE FEED key to accept the date printed.
HH:MM?	Type the time in 24-hour or AM/PM format, as in 15:12 or 3:12 PM. Press the LINE FEED key to accept the time printed.
DISK?	Type the name of the disk on which to allocate files. Valid disk names are DC, DF, DS, DK, DM, DP, and DB. Press LINE FEED to use the system disk.
UNIT?	Type the physical unit number of the disk. This question is not asked if the response to the previous question was DC, DF, or LINE FEED.
CLEAN?	Type YES to clean the disk. Type NO or the LINE FEED key if you are certain that the directory structure of the disk is not corrupt. This question is asked only if the disk was logically dismounted after its last use. If the disk was not logically dismounted, the REFRESH option automatically cleans the disk.

REFRESH automatically cleans a disk that was improperly removed from the system (i.e., it was not logically dismounted). If your disk was properly dismounted, REFRESH asks the CLEAN? question. Specify a cleaning operation if you suspect that the disk has a corrupt file structure. Any ?BAD DIRECTORY FOR DEVICE errors occurring on a particular disk indicate a corrupt file structure on that disk. You should also specify a cleaning operation if a file containing a bad block was deleted during timesharing. The cleaning operation frees the portion of the file that did not contain any bad blocks. The amount of time required for the clean operation depends on the type of disk and the number of files it contains.

After all preliminary questions have been asked and answered, you can begin to use the REFRESH suboptions to allocate files. Table 3-12 lists the suboptions.

Table 3-12
REFRESH Suboptions

Suboption	Function
LIST	List the file status table
CHANGE	Change the system file allocation
FILE	Change the characteristics of a file in [0,1]
BADS	Examine or add to the bad block file

To use a suboption, type the first two or more characters of its name in response to the REFRESH SUBOPTION? query. REFRESH executes the suboption dialogue, makes any requested changes, and returns to the REFRESH SUBOPTION? query. You can then specify another suboption or type CTRL/Z to return to the DISK? query. When you are finished with the REFRESH option, type EXIT or the LINE FEED key to return to the OPTION: query.

3.7.3 Listing the File Status Table

The LIST suboption lists the file status table. This table includes all the files that may be in account [0,1] on the system disk. The files are divided into two categories: (1) the system files (under the heading System Files:) that you can manipulate with the REFRESH option and (2) other files (under the heading Others:). If you need a listing of only the files in the Others: category, type CTRL/O during the printing of the system files. The output automatically resumes printing at the Others: header. The following is a sample file status table:

```
REFRESH suboption? LIST

File                          File          Current   Minimum     Start
Name       Required?  File Flags Status      Size      Size       LBN

System files:

SWAP   .SYS    YES    NOD CTG     OK          224       128      2132
SWAP0  .SYS    NO                 OK
SWAP1  .SYS    NO                 OK
SWAP3  .SYS    NO                 OK
OVR    .SYS    NO                 OK                    43
ERR    .SYS    NO                 OK                     8
BUFF   .SYS    YES                CRE                    6
CRASH  .SYS    NO     NOD CTG     OK          35        35      2356

Others:

BADB   .SYS            NOD                    0
SATT   .SYS            NOD CTG                2                   9
INIT   .SYS            NOD                  210
RSTS   .SIL            NOD CTG              214
RT11   .RTS                CTG               20                 452
BASIC  .RTS            NOD CTG               68                 472
ERR    .ERR            NOD CTG                8                 218


REFRESH suboption?
```

NOTE

The file status table lists only files in account [0,1]. Remember that the availability of space on the disk depends not only on the sizes of the files in account [0,1], but also in other accounts on the disk.

The file status table is divided into seven columns, which are labelled File Name, Required?, File Flags, Status, Current Size, Minimum Size, and Start LBN. Table 3-13 summarizes the file status table entries.

The File Name column lists all the files in account [0,1] by name.

The entry in the Required? column indicates whether the file is required for operation of the currently installed RSTS/E monitor. This column is blank for nonsystem files in [0,1] (i.e., files listed under the Others: heading). The file SWAP.SYS is always required on the system disk. The file BUFF.SYS is required on the system disk if the installed monitor supports DECtape. All other system files are optional on the system disk. All files are optional on a nonsystem disk.

Table 3-13
File Status Table Entries

Entry Heading	Possible Entries	Meaning
File Name	All files in account [0,1]	Files are divided into two categories under the headings System Files: and Others:.
Required	YES	The file is required for operation of the current monitor.
	NO	The file is not needed to operate the system.
	(blank)	The file is not a system file.
File Flags	NOD	The file cannot be deleted.
	CTG	The file is contiguous on the disk.
Status	OK	No REFRESH action is required.
	CRE	You must create the file.
	D/C	You must delete and re-create the file.
Current Size	n	n is the decimal number of 256-word blocks the file occupies on the disk.
	(blank)	The file does not exist.
Minimum Size	n	n is the decimal number of 256-word blocks the file minimally requires.
Start LBN	n	n is the logical block number (in decimal) at which each contiguous file starts. Disk logical blocks are numbered from 0 to (disk size - 1).
	(blank)	If the CTG flag is not present, the file is not contiguous. If the CTG flag is present, the file is currently contiguous but may be extended, becoming noncontiguous.

The File Flags column can contain the entries NOD and CTG. The entry NOD for a file means that users cannot delete that file during timesharing; the file can be deleted only during the use of the REFRESH option. The entry CTG means that the file is contiguous.

The Status column (which is always blank for files in the Others: category) contains the entry OK, CRE, or D/C. The entry OK means that you need not use REFRESH on the file. The entry CRE means that you must use REFRESH to create the file. The entry D/C means that you must delete the file and re-create it.

The Current Size column lists the current size of each existing file. If the file does not exist on the disk that is being REFRESHed, this column remains blank.

The Minimum Size column (which is blank for all files in the Others: category) lists the minimum size (in blocks) for each file if RSTS/E is to use that file. The minimum size for SWAP.SYS is four times the current value of SWAP MAX multiplied by two (to hold two jobs). If you have not yet set defaults for the installed monitor, the minimum size is 64 blocks – 2 jobs at 8K words each. ERR.SYS must always be at least eight blocks long. The minimum sizes of OVR.SYS and CRASH.SYS depend on the installed RSTS/E monitor. BUFF.SYS must contain at least three blocks for each DECtape unit that the installed monitor supports. The Minimum Size column is blank for OVR.SYS, CRASH.SYS, and BUFF.SYS if no monitor is currently installed. The column is blank for SWAP.SYS, CRASH.SYS, and BUFF.SYS if you are not REFRESHing the system disk because RSTS/E can use these files only on the system disk.

The column labelled Start LBN lists the logical block number (in decimal) at which each of the contiguous files starts. If a file does not exist or is not contiguous, its entry in the Start LBN column is blank.

3.7.4 Changing System File Allocation

The CHANGE suboption allows you to create, delete, and relocate contiguous files on disk. Since CHANGE creates and relocates files by manipulating the directory structure, you should not use it on files that contain data (such as ERR.ERR). CHANGE does not copy files; it merely allocates them in directories. The CHANGE suboption destroys the data in the files it manipulates.

CHANGE begins by asking questions about each of the files it can manipulate. When the dialogue is complete, CHANGE performs the specified file operations and returns to the REFRESH SUBOPTION? query. To exit from the suboption before answering all questions, type CTRL/C. Table 3-14 summarizes the CHANGE queries and possible responses.

Table 3-14
CHANGE Suboption Questions and Responses

Question	Possible Responses	Meaning
filnam.ext CHANGES?	NO, OLD, LINE FEED key	If the file exists, accept its current size and location and skip the remaining questions for this file.
	YES	If the file exists, skip to the DELETE? question. If the file does not exist, skip to the SIZE? question.
	CTRL/Z	Return to the REFRESH SUBOPTION? question.
OTHER FILES?	NO, N, LINE FEED key, CTRL/Z	Last question in the CHANGE suboption. Returns to the REFRESH suboption? question.
	filnam.ext	Allows you to create or delete other [0,1] files. This capability is intended primarily for DIGITAL software support personnel. Certain system files in [0,1] (such as INIT.SYS) must never be modified. If the named file exists, skip to the DELETE? question. If the file does not exist, skip to the SIZE question.
DELETE?	NO, OLD, LINE FEED key	Asked only if the file exists. Skip to the SIZE? question.
	YES	Delete the file and skip the remaining questions for this file.
	CTRL/Z	Return to the first question for this file.
SIZE?	OLD, LINE FEED key	If the file exists, retain the current size. If REFRESH is creating the file, create it at the minimum size.
	n	n, a positive nonzero integer, is the decimal number of blocks allocated to the file.
	CTRL/Z	Return to the filnam.ext CHANGES? question for this file (or to the OTHER FILES? question if the current file is not a system file).
BASE?	OLD, LINE FEED key	If the file exists, use the logical block number (in decimal) at which it now starts as its starting location. If creating the file, use a default of 0 (anywhere on the disk).
	n	n is a decimal number that specifies the starting logical block number for the file. If n is 0, place the file anywhere on the disk.
	CTRL/Z	Return to the first question for this file.

CHANGE can alter characteristics of the files SWAP.SYS, SWAP0.SYS, SWAP1.SYS, SWAP3.SYS, OVR.SYS, ERR.SYS, BUFF.SYS, and CRASH.SYS. It also allows you to create or delete other files (with the OTHER FILES? question) in account [0,1]. The suboption poses all of the questions in Table 3-14 for each file in the above list, substituting the name of the file for filnam.ext in the question. The following is an example of CHANGE:

```
REFRESH suboption? CH          line a
SWAP.SYS changes? Y            line b
  Size? 224                    line c
  Base? <LF>                   line d
SWAP0.SYS changes? <LF>        line e
SWAP1.SYS changes? <LF>        line f
SWAP3.SYS changes? <LF>        line g
OVR.SYS changes? <LF>          line h
ERR.SYS changes? <LF>          line i
BUFF.SYS changes? Y            line j
  Size? 12                     line k
  Base? <LF>                   line l
CRASH.SYS changes? Y           line m
  Size? 80                     line n
  Base? <LF>                   line o
Other files? <LF>              line p
REFRESH suboption?
```

In the example, the user allocates files for the SYSGEN system. First, he requests the CHANGE suboption (line a). He then creates a SWAP.SYS file (line b) of 224 blocks (line c), which holds 2 jobs at a maximum size of 28K words. He presses the LINE FEED key in response to BASE? (line d) and the REFRESH option places SWAP.SYS at the first available space on the disk. The user presses the LINE FEED key to make no changes to the files SWAP0.SYS, SWAP1.SYS, SWAP3.SYS, OVR.SYS, and ERR.SYS (lines e through i). He creates BUFF.SYS (line j) at 12 blocks (line k) for four DECtape drives and creates CRASH.SYS (line m) at the maximum size of 80 blocks. The user does not position either of the files (lines l and o). Finally, he presses the LINE FEED key in response to the OTHER FILES? question (line p) to omit changes to any other files in account [0,1]. REFRESH then returns to the REFRESH SUBOPTION? query.

3.7.5 Changing [0,1] File Characteristics

The FILE suboption allows you to create, delete, or mark as deletable or not deletable files in account [0,1]. It is intended mainly for two uses: 1) deleting obsolete run-time system files, and 2) marking other files as deletable or not deletable.

When you invoke the FILE suboption, REFRESH responds by asking you for the name of the file to modify. Reply with a filename and extension. If the file exists in account [0,1], REFRESH asks whether to delete it. Type YES or NO in response. If your response is NO, REFRESH retains the file. It then asks SIZE? and BASE? questions as in the CHANGE suboption. Refer to Table 3-14 for a summary of responses to these questions.

NOTE

The files INIT.SYS, the default error message file (e.g., ERR.ERR), the installed monitor SIL, and the default run-time system file must never be modified.

REFRESH allows you to change the status of the "do not kill" bit in the directory entry for the named file. When this bit is on, users cannot delete or rename the file under RSTS/E timesharing. The bit is automatically turned on when you set defaults (for the default error message and run-time system files), when you install the monitor SIL, and when you create other system files. When the bit is off, any privileged user can delete the file. To turn off the bit, type YES in response to the DELETABLE? query. To turn on the bit, type NO. To retain the current status of the bit, type OLD or the LINE FEED key.

The capability to set and reset this bit can be useful in many circumstances. For example, if your system has important accounting files that you want to protect from deletion, you can simply use the PIP program during timesharing to transfer the files to account [0,1] and set the "do not kill" bit. This bit protects the files so that they cannot be deleted during timesharing. Files for which the "do not kill" bit is set can, however, be extended. Only another use of the REFRESH option can delete them. The following example shows the use of the FILE suboption to set the "do not kill" bit for the file ROLLIN.SAV.

```
REFRESH suboption? FILE

  File name? ROLLIN.SAV

  File exists. Delete it? N

  Size? (LF)

  Base? (LF)

  Deletable? N

  File name? (LF)

REFRESH suboption?
```

Be careful to specify OLD or LINE FEED in response to the SIZE? and BASE? questions if you wish to retain the data in the files. The REFRESH option manipulates directory information only; it does not transfer actual file data. Therefore, if you do not reply to these questions with OLD or LINE FEED, REFRESH may reallocate the file and the data may be lost.

3.7.6 Expanding the Bad Block File

The BADS suboption enables you to list the bad blocks currently in the bad block file for the disk currently being REFRESHed and to add bad blocks to the file.

To use BADS, type BADS or BA. REFRESH responds with BADS?. Type LIST for a listing of the current contents of the file BADB.SYS. The list is in the following format:

```
Bads? LIST

Pack cluster size = 1

Bad clusters begin at logical block numbers:

3237     4177

Bads?
```

If the file contains no bad blocks, REFRESH responds as follows:

```
Bads? LIST

There are no bad blocks.

Bads?
```

After the listing (or message) is complete, REFRESH returns to the BADS? query. Type ADD to add bad blocks to the file. REFRESH responds with BLOCK NUMBER? Reply with the logical block number (in decimal) of the bad block. This number can be from 1 to the disk size minus 1. You can obtain the logical block number of a bad block from the ERRDIS print-out of the disk error. REFRESH questions you to ensure that you have typed the correct number. Reply with YES or NO. If your response is YES, REFRESH allocates the pack cluster in which the block resides to BADB.SYS. If you reply NO, REFRESH repeats the BLOCK NUMBER? prompt. Be careful to specify the correct block number. The allocation of a cluster to BADB.SYS is irrevocable.

After you have added all bad blocks to the file, type EXIT or LINE FEED to return to the REFRESH SUBOPTION? query. If you added any bad blocks to the bad block file, REFRESH now cleans the disk. The cleaning operation allows you to delete all files that contain bad blocks.

The following example illustrates the use of BADS:

```
REFRESH suboption? BADS

Bads? ADD

Block number? 2102

Really add logical block 2102 to BADB.SYS? Y

Block number? (LF)

Bads? LIST

Pack cluster size = 1
```

```
    Bad clusters begin at logical block numbers:

3237     4177     2102

    Bads? (LF)

Disk is being cleaned - wait ...

    REFRESH suboption?
```

3.7.7 REFRESH Option Examples

Two examples of the use of the REFRESH option follow. The examples show some of the possible philosophies with which you can use the REFRESH option. In the first example, the system files are structured to allow future expansion. The second example is a small system where disk space is of primary importance. On this system, a reasonable structure of system files is created but no provision is made for future expansion.

3.7.7.1 RP04 System Disk with RS04 Disk – The first example shows a system file allocation typical for a large system. The hardware configuration includes an RP04 system disk and an auxiliary RS04 fixed head disk. Four DECtapes are also included in the system. The system is configured for a maximum of 40 jobs at a maximum size of 28K words each. The print-out of this example begins on the next page.

After the user answers the date and time question, the REFRESH option requests the name of the disk on which it should manipulate files. The user first allocates files on the auxiliary fixed head disk. (He has already used the DSKINT option to perform pattern checking and write a minimal RSTS/E file structure on this disk.) The user types his answer, DS, at line a, then types the unit number in response to the UNIT? question. Next, at line b, the user requests a cleaning operation to ensure that the file structure on the disk is not corrupt. He uses the LIST suboption at line c to obtain a listing of the current File Status Table for the disk.

The user now uses the BADS suboption to list the bad block file, which as you can see (line d), is empty. He has no bad blocks to add, so he types EXIT to return to the REFRESH SUBOPTION? question.

Beginning at line e, the user changes the system file allocation. First, he requests the CHANGE suboption, which allows him to create, delete, and position system files. He does not request changes to SWAP.SYS, because RSTS/E requires that file on the system disk. The first file he changes is SWAP0.SYS, at line f. He calculates the largest number of jobs (at the maximum size of 28K) that can fit on the RS04 disk, leaving room for the files ERR.SYS (8 blocks) and OVR.SYS (43 blocks) and the file structure. Of the total 2048 blocks, he can allocate approximately 1998 blocks as swapping space. (Some of this remaining space contains the RSTS/E file structure. Refer to Section 3.7.1.1 for further information.) Therefore, the user can allocate a swapping file that holds 17 jobs on the fixed head disk. At line g, he creates the file SWAP0.SYS at a size of 1904 blocks (1904 blocks = 17 jobs * swap maximum of 28K words * 4 blocks per 1K words). He does not specify a base position because positioning is not important on a fixed head disk. The user does not create the two remaining swapping files.

At line h, the user creates the file OVR.SYS to hold the overlay code. The size of OVR.SYS is 43 blocks, which is the minimum size listed in the File Status Table. He also creates (at line i) ERR.SYS at a size of 8 blocks. He presses the LINE FEED key in response to the remaining questions. The REFRESH option automatically returns to the REFRESH SUBOPTION? question. In response to this question, the user types CTRL/Z (line j) to return to the DISK? question.

```
Option: REFRESH

19-OCT-76? (LF)
04:50? (LF)

Disk? DS                                                        line a
Unit? 0

Clean? Y                                                        line b

Disk is being cleaned - wait ...


  REFRESH suboption? LIST                                       line c

  File                        File          Current  Minimum    Start
  Name       Required?  Class Status          Size     Size      LBN

System files:

  SWAP   .SYS     NO              OK
  SWAP0  .SYS     NO              OK
  SWAP1  .SYS     NO              OK
  SWAP3  .SYS     NO              OK
  OVR    .SYS     NO              OK                      43
  ERR    .SYS     NO              OK                       8
  BUFF   .SYS     NO              OK
  CRASH  .SYS     NO              OK

Others:

  BADB   .SYS             NOD                 0
  SATT   .SYS         NOD CTG                 1                  2


  REFRESH suboption? BADS                                       line d

    Bads? LIST

    There are no bad blocks.

    Bads? EXIT

  REFRESH suboption? CHANGE                                     line e

  SWAP.SYS changes? (LF)

  SWAP0.SYS changes? Y                                          line f

    Size? 1904                                                  line g

    Base? (LF)
```

```
SWAP1.SYS changes? LF

SWAP3.SYS changes? LF

OVR.SYS changes? Y                                          line h

  Size? 43

  Base? LF

ERR.SYS changes? Y                                          line i

  Size? 8

  Base? LF

BUFF.SYS changes? LF

CRASH.SYS changes? LF

Other files? LF

REFRESH suboption? ^Z                                       line j

Disk? LF                                                    line k

Clean? N                                                    line l

REFRESH suboption? LIST                                     line m

File                    File          Current   Minimum     Start
Name      Required?  Flags Status       Size      Size       LBN

System files:

SWAP   .SYS   YES          CRE                    224
SWAP0  .SYS    NO           OK
SWAP1  .SYS    NO           OK
SWAP3  .SYS    NO           OK
OVR    .SYS    NO           OK                     43
ERR    .SYS    NO           OK                      8
BUFF   .SYS   YES          CRE                     12
CRASH  .SYS    NO           OK                     34

Others:

BADB   .SYS          NOD                0
SATT   .SYS      NOD CTG               11                  12
INIT   .SYS      NOD CTG              209                  28
SYSGEN.SIL           CTG              185                 240
RT11   .RTS          CTG               20                 428
ERR    .ERR      NOD CTG                8                 448
RSTS   .SIL          NOD              205
BASIC  .RTS      NOD CTG               72                4520
```

```
  REFRESH suboption? CHANGE                                        line n

  SWAP.SYS changes? Y                                              line o

    Size? 2576

    Base? 80000

  SWAP0.SYS changes? (LF)

  SWAP1.SYS changes? (LF)

  SWAP3.SYS changes? (LF)

  OVR.SYS changes? (LF)

  ERR.SYS changes? (LF)

  BUFF.SYS changes? Y                                              line p

    Size? 12

    Base? 80000

  CRASH.SYS changes? Y                                             line q

    Size? 80

    Base? (LF)

  Other files? (LF)

  REFRESH suboption? LIST                                          line r

  File                    File          Current   Minimum    Start
  Name       Required?    Flags Status    Size      Size      LBN

System files:

  SWAP   .SYS    YES    NOD CTG    OK      2576       224     80000
  SWAP0  .SYS     NO               OK
  SWAP1  .SYS     NO               OK
  SWAP3  .SYS     NO               OK
  OVR    .SYS     NO               OK                43
  ERR    .SYS     NO               OK                 8
  BUFF   .SYS    YES    NOD CTG    OK        12       12     82576
  CRASH  .SYS     NO    NOD CTG    OK        80       34       692

Others:

  BADB   .SYS             NOD                0
  SATT   .SYS           NOD CTG             11                  12
  INIT   .SYS           NOD CTG            209                  28
  SYSGEN.SIL              CTG              185                 240
  RT11   .RTS             CTG               20                 428
  ERR    .ERR           NOD CTG              8                 448
  RSTS   .SIL             NOD              205
  BASIC  .RTS           NOD CTG             72                4520


  REFRESH suboption? EXIT                                          line s


Option:
```

The user now allocates files for the system disk. He presses the LINE FEED key in response to the DISK? question (line k) to specify the system disk. He omits the cleaning operation (line l) because he recently initialized the disk and is sure that the file structure is not corrupt. Next, he specifies the LIST suboption (line m) to list the File Status Table for the system disk.

The user now selects the CHANGE suboption (line n) and begins to allocate system files on the system disk. First, at line o, he requests changes to the file SWAP.SYS. Since the fixed head disk cannot accommodate all the required swapping space, the user must allocate additional swapping space on the system disk. The user creates SWAP.SYS at 2576 blocks, which is large enough for 23 jobs at 28K words each. This file provides the remaining swapping space that the system requires so the user need not create other swapping files. Note that the user specifies a preferred starting location of 80000 to place SWAP.SYS near the center of the 167200-block RP04. He can group the frequently accessed system files near the middle of the disk to create a quiescent or "home" position there for the disk heads. By doing so, he reduces the seek distance to user file data on either side of the center. The effect of this grouping becomes more pronounced as user files and directories fill the disk.

The user does not create on the system disk the other swapping files or the overlay and error message files. He does, however, create the file BUFF.SYS (line p), which this system requires for its four DECtape drives. RSTS/E requires that BUFF.SYS contain at least three blocks for each DECtape unit. The user creates the file at the required size of 12 blocks. The final system file the user allocates is the crash dump file, CRASH.SYS (line q). Although the minimum size for CRASH.SYS is 34 blocks, he creates the file at the maximum of 80 blocks. The large CRASH.SYS file permits future expansion and reserves extra contiguous space that may be needed later. The user does not position CRASH.SYS because it is not frequently used.

At line r, the user specifies the LIST suboption to obtain a final listing of the File Status Table. The REFRESH option has placed all files as the user requested. Finally, at line s, the user exits from the REFRESH option. The initialization code returns to the OPTION: prompt. The user in the example can now proceed to establish default start up conditions (described in Section 3.8) for the new monitor.

3.7.7.2 RK05 System Disk – The second example shows the use of the REFRESH option on a smaller system which includes two RK05 disks (one of which is the system disk) and no fixed head disks. The hardware configuration also includes two DECtape units. The maximum number of jobs on this system is 20, and their maximum size is 16K words. The example begins on the next page.

In this example, the user answers the date and time questions. He then presses the LINE FEED key in response to the DISK? question (line a) to use the REFRESH option on the system disk. At line b, the user omits a cleaning operation on the system disk because he is sure that the file structure on the disk is not corrupt. REFRESH then asks the REFRESH SUBOPTION? question. The user specifies the LIST suboption (line c) to obtain a listing of the File Status Table.

The user now uses the BADS suboption to list the bad block file, which (line d) is empty. He has no bad blocks to add, so he types EXIT to return to the REFRESH SUBOPTION? question.

He next uses the CHANGE suboption (line e), which allows him to create, delete, and position files on the disk. He types Y in response to the SWAP.SYS CHANGES? question at line f to create and position the file SWAP.SYS. RSTS/E requires that SWAP.SYS exist on the system disk at a size large enough to hold at least two jobs at the maximum size of 16K words.

The user can allocate all swapping space in SWAP.SYS on the system disk or he can divide the swapping space between the two RK05 disks. Before he allocates swapping space on the second RK05 unit, he should be reasonably certain that the disk will always be mounted. (It can be either a public or private disk.) If the second disk becomes unavailable for use during timesharing, the system runs with a reduced job maximum until the system manager can allocate additional swapping space for that timesharing session. In this example, the user is reasonably certain that the second RK05 disk

```
Option: REFRESH

19-OCT-76? LF
05:59? LF

Disk? LF                                                        line a

Clean? N                                                        line b

  REFRESH suboption? LIST                                       line c

  File                        File          Current  Minimum    Start
  Name       Required?  Flags Status          Size     Size      LBN

System files:

  SWAP   .SYS   YES          CRE                      128
  SWAP0  .SYS    NO          OK
  SWAP1  .SYS    NO          OK
  SWAP3  .SYS    NO          OK
  OVR    .SYS    NO          OK                       43
  ERR    .SYS    NO          OK                        8
  BUFF   .SYS   YES          CRE                       6
  CRASH  .SYS    NO          OK                       22

Others:

  BADB   .SYS                NOD                       0
  SATT   .SYS            NOD CTG                       1          5
  INIT   .SYS            NOD CTG                     209         13
  SYSGEN.SIL             NOD CTG                     185        223
  RT11   .RTS            NOD CTG                      20        409
  ERR    .ERR            NOD CTG                       8        429
  ROLLIN.SAV             NOD CTG                      18        697
  BASIC  .RTS            NOD CTG                      72        745
  RSTS   .SIL            NOD CTG                     205        817
 REFRESH suboption? BADS

   Bads? LIST                                                   line d

   There are no bad blocks.

   Bads? EXIT

 REFRESH suboption? CHANGE                                      line e

 SWAP.SYS changes? Y                                            line f

   Size? 640                                                    line g

   Base? 2200                                                   line h

 SWAP0.SYS changes? LF

 SWAP1.SYS changes? LF
```

```
SWAP3.SYS changes? LF

OVR.SYS changes? LF

ERR.SYS changes? LF

BUFF.SYS changes? Y                                          line i

  Size? 6

  Base? LF

CRASH.SYS changes? Y                                         line j

  Size? 22                                                   line k

  Base? LF

Other files? LF

REFRESH suboption? LIST                                      line l

File                    File          Current   Minimum     Start
Name      Required?  Flags Status      Size      Size        LBN

System files:

SWAP   .SYS   YES   NOD CTG   OK        640       128        2201
SWAP0  .SYS    NO             OK
SWAP1  .SYS    NO             OK
SWAP3  .SYS    NO             OK
OVR    .SYS    NO             OK                43
ERR    .SYS    NO             OK                 8
BUFF   .SYS   YES   NOD CTG   OK          6       6         445
CRASH  .SYS    NO   NOD CTG   OK         22      22         451

Others:

BADB   .SYS         NOD                   0
SATT   .SYS         NOD CTG               1                   5
INIT   .SYS         NOD CTG             209                  13
SYSGEN.SIL          NOD CTG             185                 223
RT11   .RTS         NOD CTG              20                 409
ERR    .ERR         NOD CTG               8                 429
ROLLIN.SAV          NOD CTG              18                 697
BASIC  .RTS         NOD CTG              72                 745
RSTS   .SIL         NOD CTG             205                 817


REFRESH suboption? ^Z                                        line m

Disk? DK                                                     line n
Unit? 1                                                      line o

Clean? Y                                                     line p

Disk is being cleaned - wait ...
```

```
  REFRESH suboption? CHANGE                                    line q

  SWAP.SYS changes? (LF)                                       line r

  SWAP0.SYS changes? Y

    Size? 640

    Base? 2200

  SWAP1.SYS changes? (LF)

  SWAP3.SYS changes? (LF)

  OVR.SYS changes? (LF)

  ERR.SYS changes? (LF)

  BUFF.SYS changes? (LF)

  CRASH.SYS changes? (LF)

  Other files? (LF)

  REFRESH suboption? LIST                                      line s

  File                        File          Current  Minimum    Start
  Name       Required?        Flags Status  Size     Size       LBN

System files:

  SWAP   .SYS    NO                 OK
  SWAP0  .SYS    NO    NOD CTG      OK       640                2200
  SWAP1  .SYS    NO                 OK
  SWAP3  .SYS    NO                 OK
  OVR    .SYS    NO                 OK                 43
  ERR    .SYS    NO                 OK                  8
  BUFF   .SYS    NO                 OK
  CRASH  .SYS    NO                 OK

Others:

  BADB   .SYS           NOD         0
  SATT   .SYS    NOD CTG            2                     3

  REFRESH suboption? EXIT                                      line t

Option:
```

will remain mounted, so he allocates only half the necessary swapping space to SWAP.SYS on the system disk. (He will create another swapping file when he uses the REFRESH option on the second disk.) Therefore, at line g, the user specifies a size of 640 blocks (10 jobs at 16K words each) for SWAP.SYS. He places the file near the center of the 4800-block disk, at block 2200 (line h). Placing frequently used system files near the center of the disk decreases the average seek time for the disk heads and improves system performance as file data become scattered across the disk. The user does not create any other swapping files on the system disk.

The overlay code and error messages already reside on the system disk in the monitor SIL. System speed does not increase if the user creates separate files on either of the RK05 units. Therefore, the user does not create the OVR.SYS and ERR.SYS files.

The user must, however, create BUFF.SYS to permit operation of the two DECtape units on the system. He creates this file at line i. The user specifies a size of six blocks (three for each unit) for BUFF.SYS.

Next, at line j, the user makes changes to the CRASH.SYS file. He allocates the minimum size of 22 blocks for CRASH.SYS (line k). This size does not allow future expansion, but a larger file is impractical on the system because disk space is limited. The user does not place CRASH.SYS near the center of the disk because it is not frequently used. The REFRESH option now returns to the REFRESH SUBOPTION? question.

Having set up all files for the system disk, the user uses the LIST suboption once again to check the file allocation (line l). He then types CTRL/Z (line m) to return to the DISK? question.

In response to the DISK? (line n) and UNIT? (line o) questions, the user specifies the second RK05 unit. At line p, the user requests that the REFRESH option clean the disk to ensure that the file structure is not corrupt. He types CHANGE in response to the REFRESH SUBOPTION? question (line q) so that he can create the additional necessary swapping file. He chooses SWAP0.SYS as the additional file (line r) because the system swaps highly interactive jobs (which should have the fastest access time available) to the first swapping slot it finds. Access to the second RK05 may be slightly faster than access to the system disk. The system normally makes fewer accesses to the second RK05 than to the system disk because it starts all searches of user directories on the system disk. Placing the burden of a frequently used swapping file on the second RK05 can help to even the load between the two disks. The user creates SWAP0.SYS at a size of 640 blocks, which is sufficient for the remaining 10 jobs at 16K words each. He places the file near the center of the disk, at block 2200, to decrease the average seek time for the disk heads. The user types LINE FEED in response to the remaining CHANGE suboption questions.

The user next selects the LIST suboption (line s) to obtain a final listing of the files for the second RK05 disk. Finally, at line t, he types EXIT to leave the REFRESH option and return to the OPTION: prompt. The user in the example can now proceed to establish default start up conditions (described in Section 3.8) for the new monitor.

3.7.8 Error Messages

Table 3-15 summarizes the error messages that can appear during the REFRESH dialogue.

Table 3-15
REFRESH Dialogue Error Messages

Message	Meaning
FILE CANNOT BE MODIFIED	You cannot modify the files BADB.SYS, SATT.SYS, or INIT.SYS (on the system disk).
ILLEGAL DISK NAME	The response you typed is not a valid disk name. Valid disk names are DC, DF, DS, DK, DM, DP, and DB. Type the LINE FEED key to use the system disk.
ILLEGAL SUBOPTION	The response you typed was not a valid suboption name.
SORRY, BUT THAT DISK DOESN'T EXIST	The disk device or unit number you specified does not exist on this PDP-11. If you disagree, use the HARDWR option to list the hardware configuration.
UNABLE TO CREATE REQUESTED FILE(S)	The disk does not contain sufficient contiguous space at the specified bases to create the specified files. Try again, specifying different bases or smaller files.

The preceding table explains only the error messages that can appear during the dialogue portions of REFRESH. For information on processing errors, refer to Appendix B.

3.8 SETTING SYSTEM DEFAULTS

The RSTS/E initialization code includes routines that allow you to establish system default start up conditions. These defaults include the following:

1. The maximum number of jobs the system allows during timesharing and the maximum storage space a job can occupy in memory and in the swapping files
2. The run-time system and error message files
3. The installation's name, which is used in LOGIN's identifying message
4. The allocation of certain portions of memory
5. The state of the crash dump facility
6. The labelling format for magtapes

You must set the defaults after you create the system files and before you start timesharing. You can override some of the default conditions (job and swap maximums, all memory allocation, and crash dump) when you start timesharing. Any changes that you make at start-up time are temporary. They apply to the current timesharing session (and any auto-restart after a system crash). After this timesharing session, the permanent defaults are again in effect.

Note that defaults are set for a particular monitor rather than for a particular system device. Therefore, you must set defaults whenever you install a monitor for the first time.

Use the DEFAULT option and its suboptions to set defaults. To invoke the DEFAULT option, type DEFAULT or DE in response to the OPTION: prompt. If you have not yet installed a SIL, DEFAULT prints the following message and returns to the OPTION: prompt.

```
DEFAULTS CANNOT BE SET UNTIL A SIL IS INSTALLED
```

Use the INSTALL option (see Section 3.6) to install a SIL.

If you have installed a SIL, but have not yet used the DEFAULT option, DEFAULT disables the responses OLD and LINE FEED to all questions and prints:

```
NO DEFAULTS ARE CURRENTLY SET
```

DEFAULT then prompts you for the information needed to set the defaults described in the following sections.

3.8.1 Setting Job and Swap Maximums

The first defaults that you set are job and swap maximums. The job maximum is the largest number of jobs that can run during RSTS/E timesharing. The default job maximum (set with the DEFAULT option) can be any value from 1 to the configured job maximum (which is the limit you set when you answer the configuration questions). The configured job maximum for the SYSGEN system (which DIGITAL sets) is two.

The swap maximum is the maximum amount of storage space that a job can occupy in a swapping file. Since all jobs must be swappable, the swap maximum is also the largest size in memory to which each job can expand.

The maximum number of jobs and the maximum size to which a job can expand affect the sizes of the swapping files. A swapping file must be at least (SWAP MAX times 4) blocks long to hold one job of size SWAP MAX. Note that SWAP MAX is measured in memory storage units (K, where 1K=1024 words), whereas file length is measured in disk storage units (blocks, where 1 block=256 words). Four blocks equal 1K words. Thus, each swap file holds an integral number of jobs, N. You can compute N by using the following equation and truncating the result to an integral value.

$$N = \frac{\text{Size of swap file in blocks}}{\text{SWAP MAX} * 4}$$

The total number of jobs that the swap files can accommodate limits the number of jobs that can log in. The one required swap file, SWAP.SYS, must be large enough to accommodate at least two jobs of size (SWAP MAX times 4) blocks. You can add up to three more swap files by using UTILTY commands in the control file at system start-up time. When you enable logins after adding a swap file to the system, the maximum number of jobs that can log in increases by the number of jobs the new swap file can accommodate. The maximum number of jobs that can log in cannot be greater than the default job maximum. If the value (2 multiplied by SWAP MAX times 4) is greater than the current size of the file SWAP.SYS, DEFAULT prints the following message:

> Warning – this SWAP MAX requires that SWAP.SYS be at least n blocks. SWAP.SYS is currently m blocks.

In the message, n is the number of blocks required to hold 2 jobs at size SWAP MAX, and m is the current size of the file SWAP.SYS.

For the SYSGEN system, you should set the job maximum at 2 and the swap maximum at 28K words (26K words on a 48K word system). For the target system, you should select values for job and swap maximums that are compatible with your software. For example, although the initialization code allows a value for SWAP MAX between 8K and 28K words, the BASIC-PLUS run-time system does not permit any of its jobs to exceed 16K. The RSTS/E COBOL compiler requires a 28K word swap maximum. FORTRAN IV requires a swap maximum of at least 8K words, but can use up to 28K words. If you plan to assemble MACRO programs under FORTRAN IV, a minimum of 12K words is necessary.

At start-up time and during the DEFAULT option, the initialization code prints the current values for job and swap maximums. It then requests any changes, as in the example that follows:

```
You currently have: JOB MAX = 2, SWAP MAX = 8K.

JOB MAX or SWAP MAX changes? Y

  New JOB MAX? (LF)

  New SWAP MAX? 28

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes? (LF)
```

When you first use the DEFAULT option on a SIL, the option prints the configured job maximum and a swap maximum of 8K words. DEFAULT then asks the JOB MAX OR SWAP MAX CHANGES? question. Answer by typing NO or LINE FEED to retain the printed values for job and swap maximums and proceed to establish default files. Answer YES to change one or both of the values. If your answer is YES, the DEFAULT option prints the NEW JOB MAX? query. Respond with a decimal number between 1 and the configured job maximum, inclusive, to change the value or with NO, OLD, or the LINE FEED key to retain the current value. The next query is NEW SWAP MAX?. Your answer can be any integer between 8 and 28, or NO, OLD or the LINE FEED key as in the previous question. When you have answered both questions, DEFAULT prints the JOB MAX and SWAP MAX values and once again allows you to change them. Respond as in the first question. When the values are correctly set, DEFAULT proceeds to questions about default files.

3.8.2 Establishing Default Files

After setting up default job and swap maximums, you must designate the default run-time system and error message files for use during timesharing. The default run-time system for most installations is BASIC-PLUS. The default run-time system file must be a contiguous file on the system disk in account [0, 1] and have the extension .RTS. The default error message file also must be in account [0, 1]. It must be exactly 8 blocks long, and have the extension .ERR. Both the error message file and the default run-time system file must be contiguous.

DEFAULT prompts you first for the name of the default run-time system file. If you have already installed a run-time system as the default, its name appears in the prompt. For the SYSGEN system, you should type RT11. For the target system, type the name (one to six alphanumeric characters) of the run-time system you desire as the default. The BASIC-PLUS run-time system you can generate with the RSTS/E monitor has the name BASIC unless you specify a different name during the configuration questions. To retain the currently installed run-time system, press the LINE FEED key in response to the prompt.

Next, DEFAULT asks you to specify the default error message file. If you have already installed an error message file, the prompt includes its name. Press the LINE FEED key to retain the current default file or type the name (one to six alphanumeric characters) of the error message file you prefer to install as the default. The following is an example of establishing default files for the SYSGEN system.

```
Run Time System? RT11

Error message file? ERR
```

DEFAULT routines ensure that each file you specify is in the correct format. The routines store the name and size of the run-time system file, for use later when memory is allocated, then proceed to set the next default.

3.8.3 Specifying the Installation Name

After you select default run-time system and error message files, DEFAULT routines ask you to specify the installation name. This name is printed in the LOGIN identifying message and is error message number 0. The name must be a string of 1 to 14 printable characters including spaces. If your console keyboard has lower case input capability, you can type the installation name in upper and lower case. The following example illustrates the procedure.

```
Installation name? *Time Sharing*
```

3.8.4 Assigning and Allocating Memory

The initialization code allows you to allocate a specific area of memory to the default run-time system, to lock and unlock areas of memory from use, and to allocate a certain portion of memory to the extended buffer pool.

If you have never set memory allocation defaults for this SIL, DEFAULT routines automatically set the defaults and print a memory allocation table. If you have previously set defaults for this SIL, DEFAULT routines check the defaults against the actual memory configuration of the PDP-11. If the defaults mark any nonexistent memory as in use, DEFAULT prints a warning message. It then resets the defaults and prints the memory allocation table.

If you installed a new default run-time system earlier in the DEFAULT procedure, DEFAULT scans the allocation table for a place for it. DEFAULT positions the run-time system if it finds enough contiguous space; it resets the entire allocation table if sufficient contiguous space is not available. It then informs you of its actions.

Next, if you previously set defaults and the allocation table is still valid, DEFAULT prints the query ANY MEMORY ALLOCATION CHANGES? Table 3-16 lists the possible responses.

Table 3-16
Possible Responses to ANY MEMORY ALLOCATION CHANGES Query

Response(s)	Meaning
NO, OLD, O, or LINE FEED key	Causes currently established memory allocation assignments to remain unchanged and the next query, CRASH DUMP?, to be printed.
RETURN key	Causes an explanatory form of the query to be printed, after which you can type your response.
YES	Causes the TABLE SUBOPTION? to be printed. See Table 3-17 for a list of table suboptions.
CTRL/C	Causes execution to be aborted and the OPTION: prompt to be printed.

In all cases where DEFAULT sets the allocation table, the first query it prints is TABLE SUBOPTION?. Table 3-17 summarizes the memory allocation table suboptions. You can abbreviate the name of any suboption to the first two characters.

Table 3-17
Memory Allocation Table Suboptions

Suboption	Purpose
LIST	Lists the memory allocation table
PARITY	Lists the parity memory configuration
RESET	Lets the initialization code reset the memory allocation table
LOCK	Locks portions of memory
UNLOCK	Unlocks portions of memory
RTS	Moves the default run-time system
XBUF	Allocates memory for the extended buffer pool

When you have made all memory allocation changes, exit from the table suboptions by typing EXIT, EX or LINE FEED. The DEFAULT option then advances to the crash dump queries.

Questions in several of the suboptions ask you to specify a memory address or a range of memory addresses. You can specify an address in either of the following two formats:

1. Give the absolute address as a four to eight digit octal address. The octal number must be a multiple of 4000 (8) that is less than or equal to 16774000.
2. Give the K address as a decimal number followed by the letter K. The decimal number must be in the range from 0 to 1919.

To specify a range of addresses, type two addresses separated by a hyphen. The address (or range of addresses) can never specify the monitor portion of memory.

3.8.4.1 Listing the Memory Allocation Table – The LIST suboption prints the current allocation table on the console terminal. This table shows how each block of memory is being used. It provides information on the following:

- The sizes of the RSTS/E monitor and default run-time system
- The amount of memory available for user jobs
- Which portions of memory are locked
- Which portions of memory are assigned to the extended buffer pool
- The total amount of memory on the computer

The following is a listing for a large system:

```
Table suboption? LI

Memory allocation table:

   0K: 00000000 - 00163777 (  29K) : EXEC
  29K: 00164000 - 00263777 (  16K) : RTS (BAS4F)
  45K: 00264000 - 00567777 (  49K) : XBUF
  94K: 00570000 - 02777777 ( 290K) : USER
 384K: 03000000 - End              : NXM


Table suboption?
```

Each row of the memory allocation breakdown includes the following, in order:

1. The start of this range (in K words)
2. The starting and ending octal addresses for this range
3. The amount of memory this range occupies (in K words)
4. The purpose for which this memory is used

Table 3-18 explains the symbols in the memory allocation table.

Table 3-18
Memory Allocation Table Symbols

Symbol	Meaning
EXEC	Occupied by RSTS/E Monitor (Executive)
RTS	Occupied by the default run-time system, which is named in parentheses
USER	Available for user space
LOCKED	Unavailable for use (locked)
XBUF	Reserved for extended buffer pool
NXM	Does not exist (nonexistent) on this PDP-11

You can use the LIST suboption as often as you need during DEFAULT as well as at start-up time. Keep a copy of the final memory allocation breakdown with other system management information for future reference.

3.8.4.2 Listing the Parity Memory Configuration – With the PARITY suboption, you can identify and locate the various types of parity memory on the computer. This suboption is used primarily as a diagnostic tool. DIGITAL Field Service personnel can use it to verify the memory configuration when they install the PDP-11. The PARITY suboption looks at the hardware parity registers to ascertain the types of memory (parity memory, interleaved parity memory, or nonparity memory) on the computer.

On a PDP-11/70, this suboption produces the following response:

```
Table suboption? PARITY

Parity register usage:

All memory is 11/70 parity memory

Table suboption?
```

A typical print-out for a PDP-11 other than an 11/70 might be the following:

```
Table suboption? PARITY

Parity register usage:

  0K: 00000000 - 00137777 (  24K) : 00
 24K: 00140000 - 00177777 (   8K) : 06
 32K: 00200000 - 00277777 (  16K) : 10(NA)
 48K: 00300000 - 00377777 (  16K) : 14(NA)
 64K: 00400000 - End              : NXM


Table suboption?
```

Table 3-19 defines the parity type codes.

The values nn and mm are the last two octal digits of the address of the parity register that controls that section of memory. Up to 16 parity registers can exist. They are in the address range 772100 to 772136. When the system detects a parity error, the parity register responsible for that section of memory usually contains information on the location of the last error discovered. The code NA indicates that the parity register contains no error address information. All parity core memory returns error address information.

Table 3-19
Parity Type Codes

Symbol	Meaning
NO	Nonparity memory
NXM	Nonexistent memory
nn/mm	Interleaved parity memory with address information
nn	Parity memory with address information
nn (NA)	Parity memory with no address information

In interleaved memory, alternate banks respond to sequential memory addresses. In the following example, parity register 00 responds to the first address (000000), while parity register 02 responds to the next address (000002) and so on.

ADDRESS	PARITY REGISTER
000000	00
000002	02
000004	00
000006	02
000010	00
000012	02

Interleaving is used because core memories are destructive read-out devices. After each read from a core memory, the system must restore the original data. However, once the processor receives the data it requested, it can go on to other things (presumably another memory access) during the restore cycle in the memory bank just accessed. The bank remains busy until the restore cycle completes. When memory is interleaved, the probability is low that the same bank of memory will be accessed on the next memory cycle. Hence, interleaving allows some overlap of memory operations and results in faster program execution.

3.8.4.3 Resetting the Memory Allocation – The RESET table suboption instructs the initialization code to set up the memory allocation table according to the following rules:

1. Place the default run-time system in low memory immediately after the monitor.
2. Do not reserve any memory for the extended buffer pool. Release any memory previously allocated to the extended buffer pool.
3. Do not lock any memory. Release to user space any memory that was previously locked.
4. Find any new memory on the system and allocate it to user space.

The following example shows the effects of the RESET suboption:

```
Table suboption? LIST

Memory allocation table:

   0K: 00000000 - 00103777 (  17K) : EXEC
  17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
  33K: 00204000 - 00243777 (   8K) : XBUF
  41K: 00244000 - 00507777 (  41K) : USER
  82K: 00510000 - 00513777 (   1K) : LOCK
  83K: 00514000 - 00757777 (  41K) : USER
 124K: 00760000 - End              : NXM


Table suboption? RESET

Table suboption? LIST

Memory allocation table:
```

```
  0K: 00000000 - 00103777 (  17K) : EXEC
 17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
 33K: 00204000 - 00757777 (  91K) : USER
124K: 00760000 - End              : NXM

Table suboption?
```

The first use of the LIST suboption shows memory locked and allocated to the extended buffer pool. After the use of the RESET suboption, the LIST suboption shows that the XBUF and LOCKed areas of memory have been released to user space.

You must use RESET whenever you add any new memory to the computer. Only RESET contains a mechanism that logically adds new memory. Generally, this is its only use.

3.8.4.4 Locking Portions of Memory – The LOCK suboption locks out certain portions of memory to prevent the use of that memory during timesharing. Use LOCK to avoid disruption of system operation when a section of memory is known to be defective. If sufficient undamaged memory remains, you can start the system for normal timesharing.

When you request the LOCK suboption, DEFAULT responds by asking for a LOCK ADDRESS. Your response should be an address or range of addresses to lock. The following example illustrates the procedure:

```
Table suboption? LOCK

  Lock address is? 80K

Table suboption? LIST

Memory allocation table:

  0K: 00000000 - 00103777 (  17K) : EXEC
 17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
 33K: 00204000 - 00477777 (  47K) : USER
 80K: 00500000 - 00503777 (   1K) : LOCK
 81K: 00504000 - 00757777 (  43K) : USER
124K: 00760000 - End              : NXM

Table suboption?
```

Certain restrictions apply to locking out memory. You cannot lock memory in use by the monitor because the monitor cannot be relocated to another section of memory. Similarly, you cannot lock memory currently allocated to the default run-time system or to XBUF until the run-time system or extended buffer space is relocated to a usable area of memory. If you try to lock out a portion of memory already in use by the monitor, default run-time system, or as extended buffer space, LOCK prints the error message PART OF THAT AREA IS ALREADY IN USE. Finally, to remove a full bank of memory from use, lock all of the 4, 8, 16, or 32 contiguous 1K sections that make up the hardware bank. If the bad memory bank is interleaved, you must lock an amount of memory equal to twice its length.

Certain types of memory failures affect only one word. Other types affect larger sections or even the full hardware bank. Carefully analyze any memory failure to determine the 1K section of memory to lock. After locking memory, study the resultant memory configuration to ensure that sufficient contiguous user memory is available to run your installation's programs.

RSTS/E can continue running with certain types of memory failures. On systems with parity memory, the error handling routines in the monitor log parity errors. The recovery procedures depend on the use of the offending section of memory at the time of the error. Consider the following four cases of memory failure and recovery procedures.

In the first case, a parity error occurs in a section of memory allocated to the monitor, run-time system, or the extended buffer pool. Since continued system operation would be risky, the monitor logs the error, takes a crash dump (if the crash dump facility is enabled), and reloads the system. When the system restarts, use the ANALYS program to extract the error log information from the CRASH.SYS file and use ERRDIS to print the location of the error. ERRDIS provides sufficient information to identify a 1K (Core) or 4K (MOS) section that should be locked out. If the error occurred in the default run-time system or extended buffer memory, you can relocate these items and lock the section. If the error was in monitor memory, the hardware must be repaired. In either case, a hard failure may prevent the system from running at all and, hence, you can run neither ANALYS nor ERRDIS. The only recourse in such cases is to run memory diagnostics to locate the problem. If the failure was transient, you can shut down the system to lock out memory or you can continue timesharing. At some point, memory diagnostics should be run to reproduce the failure, if possible.

The second case differs slightly from the first. If a parity error occurs in user memory, the parity error handling routines determine whether a single user is affected (i.e., resides in the malfunctioning section) or more than one user is affected. If more than one user is affected, the system is reloaded as described previously. If a single user is affected, the system aborts that user with the error message ?MEMORY PARITY FAILURE. The monitor logs the error, automatically locks out the section from future use (if the error was reproducible), and the system continues running. You should permanently lock out the bad section of memory (until repaired) using the LOCK suboption the next time you start the system.

In the third case, multiple parity errors occur in rapid succession. RSTS/E halts at location 54 (56 is displayed in the lights) if a second parity error occurs while the system is processing the first parity error. Use memory diagnostics to locate the failing memory.

The fourth case concerns a parity error on a PDP-11/70. If the PDP-11/70 hardware cache malfunctions and causes a parity error, the hardware refetches the needed word from main memory and causes a warning parity trap to occur. RSTS/E logs this type of error. If the error occurs twice within one minute and is reproducible, RSTS/E disables the half of the cache causing the malfunction. RSTS/E continues running but with degraded performance. The system does not print a message, but two successive errors within the same minute in the ERRDIS printout should alert you. Examine the control register data reported by ERRDIS to find out which half of the cache is disabled.

On systems without parity memory, the software cannot detect or locate a memory failure. Programs may get incorrect results, memory management errors may occur, or any number of random problems may happen. At worst, the system may crash with misleading clues as to the cause.

3.8.4.5 Unlocking Portions of Memory – The UNLOCK suboption frees a previously locked portion of memory for use by user jobs, the default run-time system, or the extended buffer pool. The following is an example of this suboption.

```
Table suboption? LIST

Memory allocation table:

   0K: 00000000 - 00103777 (  17K) : EXEC
  17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
  33K: 00204000 - 00477777 (  47K) : USER
  80K: 00500000 - 00503777 (   1K) : LOCK
  81K: 00504000 - 00757777 (  43K) : USER
 124K: 00760000 - End              : NXM


Table suboption? UNLOCK

  Unlock address is? 80K

Table suboption? LIST

Memory allocation table:

   0K: 00000000 - 00103777 (  17K) : EXEC
  17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
  33K: 00204000 - 00757777 (  91K) : USER
 124K: 00760000 - End              : NXM


Table suboption?
```

3.8.4.6 Positioning the Default Run-Time System – The RTS suboption places the default run-time system (usually BASIC-PLUS) anywhere in the first 124K of memory. It is generally advantageous to place the default run-time system (or extended buffer space) in solid-state memory, when it is available. Most of the processing done by RSTS/E systems involves executing BASIC-PLUS programs. Thus, to optimize performance, position the BASIC-PLUS run-time system in the fastest memory available on the system. If your system has a mixture of fast and slow core memory, you may gain a small advantage by locating BASIC-PLUS in fast core. Generally, the only reason to position BASIC-PLUS on systems without solid-state memory is to avoid defective memory. If you do not position the run-time system, DEFAULT places it immediately after the RSTS/E monitor in the lowest physical memory addresses.

When you specify the RTS suboption, DEFAULT responds with NEW RUN TIME SYSTEM ADDRESS IS? Reply with the address (in the format described in Section 3.8.4) at which you choose to start the run-time system. There must be sufficient free contiguous space for the default run-time system between the starting address you specify and 124K. The following example illustrates the use of RTS.

```
Memory allocation table:

   0K: 00000000 - 00137777 (  24K) : EXEC
  24K: 00140000 - 00237777 (  16K) : RTS (BASIC)
  40K: 00240000 - 00377777 (  24K) : USER
  64K: 00400000 - End              : NXM


Table suboption? PARITY

Parity register usage:
```

```
  0K: 00000000 - 00137777 (  24K) : 00
 24K: 00140000 - 00177777 (   8K) : 06
 32K: 00200000 - 00277777 (  16K) : 10(NA)
 48K: 00300000 - 00377777 (  16K) : 14(NA)
 64K: 00400000 - End              : NXM

Table suboption? RTS

  New Run Time System address is? 48K

Table suboption? LIST

Memory allocation table:

  0K: 00000000 - 00137777 (  24K) : EXEC
 24K: 00140000 - 00277777 (  24K) : USER
 48K: 00300000 - 00377777 (  16K) : RTS (BASIC)
 64K: 00400000 - End              : NXM


Table suboption?
```

Under certain conditions, you should not place BASIC-PLUS in solid-state memory. Consider the following configuration where the memory allocated to the Monitor is shown but, for the purpose of this illustration, the location of BASIC-PLUS is not shown.

Locations 0000000 through 0117777 (20K) are RSTS Executive
Locations 0120000 through 0177777 (12K) are available core
Locations 0200000 through 0277777 (16K) are available solid-state memory
Locations 0300000 through 0337777 (8K) are available core
Locations 0340000 upwards are nonexistent.

Assume that the size of BASIC-PLUS is 14K words. If BASIC-PLUS is located at address 0200000, the remaining user memory is divided into one 12K section below and one 10K section above. Because the system loads user job images into contiguous physical memory, no program larger than 12K can run with this memory configuration. In this system, BASIC-PLUS should be placed at the high end of available memory starting address 250000, leaving 22K words of contiguous memory for user jobs between the Monitor and BASIC-PLUS. This configuration allows 16K programs to be run at the expense of not using the high speed solid-state memory to full advantage. Only 6K words of memory are used for BASIC-PLUS while the other 10K words are part of the 22K words of user memory. Ensure that the location of BASIC-PLUS on your system leaves sufficient memory for user jobs.

3.8.4.7 Reserving Memory as Extended Buffer Space – You can reserve memory as extended buffer space with the XBUF suboption. Message send/receive, the DECNET/E package, the RSTS/2780 package, and the FIP buffering module use this reserved memory; if none is available, they use small buffers.

DIGITAL recommends that you allocate extended buffer space on all systems with sufficient memory. The amount of extended buffer space you should allocate depends on the type of processing done on the system. The FIP buffering module uses extended buffer space in 512-byte (256-word) sections, and can use at most 175K words of extended buffer space. If you allocate more than 8K words of extended buffer space, the FIP buffering module will not try to use small buffers for disk directory storage at all.

The message send/receive code uses extended buffer space to store messages. The amount of space it uses depends on the length and number of outstanding messages on the system. Each message requires a number of bytes equal to the length of the message plus 8 bytes, rounded up to the next multiple of 64 bytes. A message always consumes at least 64 bytes of extended buffer space; it can consume at most 576 bytes.

The DECNET/E package uses extended buffer space to hold inter-job messages. DECNET/E requires at least 4K words of extended buffer space for optimal performance. For the RSTS/2780 package, you should allocate an additional 1K words of XBUF space.

The DECNET/E package and message send/receive code use buffer space in large, contiguous sections. If you are unable to allocate sufficient extended buffer space for these facilities, you may need to configure more small buffers (Section 4.2.8.2).

When you request the XBUF suboption, DEFAULT responds by asking for the extended buffer address range. You can reply with an address or a range of addresses identifying the memory to reserve. (Refer to Section 3.8.4 for a description of the format for your response.) XBUF memory must be in the range 00100000 (16K) to 03777700 (511K). The allocation table must currently designate the memory you plan to reserve for extended buffer space as either USER or XBUF memory. If high-speed solid-state memory is available, you should place the XBUF space in it to further enhance system performance.

When you allocate memory to extended buffer space, DEFAULT releases any memory previously allocated for that purpose. You can reserve only one region of memory as extended buffer space. To release previously allocated XBUF memory to USER space, type RE (or REMOVE).

The following example illustrates the use of the XBUF suboption.

```
Table suboption? XBUF

  Extended buffer address range is? 115K-127K

Table suboption? LI

Memory allocation table:

   0K: 00000000 - 00147777 (  26K) : EXEC
  26K: 00150000 - 00247777 (  16K) : RTS (BASIC)
  42K: 00250000 - 00713777 (  73K) : USER
 115K: 00714000 - 00777777 (  13K) : XBUF
 128K: 01000000 - End               : NXM


Table suboption?
```

3.8.5 Enabling and Disabling the Crash Dump Facility

After you have set the memory allocation, DEFAULT routines print the current status of the crash dump facility. The message is one of the following:

```
You currently have crash dump enabled.

You currently have crash dump disabled.
```

The routines then check that the file CRASH.SYS 1) is present in account [0,1] on the system disk, 2) is large enough for the monitor and 3) is contiguous. If the file does not meet all three of these conditions, DEFAULT prints an appropriate warning text. If CRASH.SYS does not meet the required conditions, and you want to enable crash dump, use REFRESH to correct CRASH.SYS before starting the system.

After checking the file and printing a message (if necessary), DEFAULT prints the CRASH DUMP? question. Reply YES to enable crash dump, or NO to disable crash dump. If the CRASH.SYS file is invalid, but you enable crash dump anyway, DEFAULT prints no further warning.

3.8.6 Specifying the Labelling Defaults for Magtape

After completing the crash dump section, DEFAULT asks the user to set the default for magtape labelling. Individual jobs can reset and restore the magtape labelling default during timesharing. A job sets its default with the ASSIGN command, described in Section 5.1 of the RSTS/E System User's Guide. An individual program sets its default with the MODE option of the OPEN statement when it opens a file on the tape. (Chapter 2 of the RSTS/E Programming Manual describes the MODE option with magtape.) You can set and reset the system default only by using the DEFAULT option. Note that the default labelling format for the SYSGEN system must be DOS.

DEFAULT routines print the following query, with NONE, DOS, or ANSI in parentheses to indicate the current setting.

```
Magtape labelling default (none)?
```

Table 3-20 lists the valid responses to the query.

Table 3-20
Valid Responses to MAGTAPE LABELLING DEFAULT Query

Response(s)	Meaning
LINE FEED key or OLD	Retain the current default. (Not valid if current default is NONE.)
DOS	Set the default format to DOS/BATCH-11 labelling. The default for the SYSGEN monitor and for building of the system library (if the distribution medium is magtape) must be DOS.
ANSI	Set the default format to ANSI standard labelling.

After you specify the magtape labelling default, DEFAULT saves the default parameters and returns to the OPTION: prompt.

3.8.7 DEFAULT Option Dialogue Error Messages

Table 3-21 explains the error messages that can occur during the DEFAULT option dialogue.

Table 3-21
DEFAULT Dialogue Error Messages

Message	Meaning
EXTENDED BUFFER SPACE NOT IN RANGE 00100000 (16K) TO 03777700(511K)	The extended buffer space must fit entirely within the specified range.
FILE NOT CONTIGUOUS	The file you specified is not contiguous on disk. The default run-time system file and error message file must be contiguous.
FILE NOT FOUND	The initialization code did not find the file you specified on disk.
ILLEGAL FILE NAME	The filename you specified is not one to six alphanumeric characters.
ILLEGAL 1K SECTION ADDRESS SPECIFIED	The address you specified is not a multiple of 4000(8) or is greater than 1919K (16774000(8)). If you specified a range of addresses, the second of the two addresses must be greater than the first.
ILLEGAL SUBOPTION GIVEN	Your response to the TABLE SUBOPTION? query is not a valid suboption name.
INVALID FILE FORMAT	The error message file you specified is not exactly eight blocks long.
INVALID MODULE FORMAT	The run-time system SIL module is too long or too short or has a high limit other than 177776(8).
INVALID SIL FORMAT	The run-time system file does not contain a valid SIL index.
MUST FIT ENTIRELY BELOW 124K	The region you specified for the run-time system extends beyond the system's upper limit of 124K.
NAME MUST BE 1 TO 14 PRINTABLE CHARACTERS	The installation name you typed is more than 14 characters long or contains unprintable characters. You cannot respond by typing the LINE FEED key if no previously typed name is available.
PART OF THAT AREA IS ALREADY IN USE	The region you specified is unavailable for use. The region must currently be allocated to USER space or to the purpose for which you wish to allocate it. (You can allocate space marked for RTS to the run-time system.)
PART OF THAT AREA IS NOT LOCKED	Part of the region you specified is not now locked and, therefore, you cannot unlock it.
RTS IS NOT A KEYBOARD MONITOR	The run-time system you specified is not a keyboard monitor. RSTS/E requires as the default a run-time system that is a keyboard monitor (e.g., BASIC-PLUS).
TOO MANY MODULES	The run-time system SIL contains more than one module.

Table 3-21 describes only the dialogue error messages. For information on other error messages that appear when you use the DEFAULT option, refer to Appendix B.

3.9 SPECIFYING CHARACTERISTICS FOR DEVICE UNITS

You can specify the characteristics of device units in the installed SIL by using the SET option. SET contains a group of suboptions (summarized in Table 3-22). These suboptions allow you to enable and disable device units, set or remove modem control on keyboards, change line printer characteristics, and set or remove restrictions on the use of devices. The ability to enable and disable device units is particularly useful. If, for instance, one of two DECtape drives is not working properly, you can simply shut up the system, disable the malfunctioning unit, and start time-sharing. Repairs can be made while the system is in use.

Table 3-22
SET Suboptions

Suboption	Function
LIST	List the status of a device
MODEM	Enable modem control for keyboards
LOCAL	Disable modem control for keyboards
LP	Set line printer characteristics
DISABLE	Disable a device unit
ENABLE	Enable a device unit
PRIV	Set restrictions on device use
UNPRIV	Remove restrictions on device use

To use the SET option, type SET or SE in response to the OPTION: prompt. In response, SET requests a suboption name. Type a suboption name from Table 3-22. (You need type only the first 2 characters.) SET executes the suboption's dialogue, makes the requested changes in the installed SIL, and returns to the SET SUBOPTION? query. When you have made all the necessary settings, type EXIT (or LINE FEED) to return to the OPTION: prompt.

3.9.1 Listing Device Status

The LIST suboption lists the status of one or more devices in the installed monitor SIL. You can use LIST to verify changes made with other SET suboptions.

To invoke LIST, type LIST or LI in response to the SET SUBOPTION? query. LIST responds by asking for the device to list. To list characteristics of only one unit, type the device name and unit number (for example, DK2). To list all units of a particular device, type the device name (for example, DK). To list a group of device units, type the device name and two unit numbers separated by a hyphen (as in DK1-3). Type ALL or the LINE FEED key to list all devices supported by the installed SIL.

The following is a sample listing using this suboption.

```
SET suboption? LIST
Device? ALL

Name   Control Comments

DK0    RK:
DK1    RK:
DM0    RM:
DM1    RM:
KB0    TT:
```

```
KB1     KL0:
KB2     DE0:
KB3     PK0:
KB4     PK1:
KB5     PK2:
KB6     PK3:
KB7     PK4:
KB8     PK5:
KB9     PK6:
KB10    PK7:
KB11    PK8:
KB12    PK9:
KB13    PK10:
KB14    PK11:
NL0
PK0
PK1
PK2
PK3
PK4
PK5
PK6
PK7
PK8
PK9
PK10
PK11
DT0     TC:
DT1     TC:
LP0     LP0:      LP, width 132
PR0     PR0:
PP0     PP0:
MT0     TM:
MT1     TM:
MT2     TM:
DX0     RX0:0
DX1     RX0:1

SET suboption?
```

In a listing, the first column contains the device name and unit number. The second column denotes the hardware controller associated with the device. For example, DM1 is associated with RM:, the RK06 disk controller. For terminal multiplexers and RX11 floppy disks, the second column also tells you the line number on the controller associated with each unit. For instance, KB32 may be attached to line 4 on the second DH11 unit; thus the listing for KB32 would include the notation DH1:4. For pseudo keyboard units, this column includes the number of the pseudo keyboard associated with the keyboard unit. For example, if KB1 is associated with a pseudo keyboard number 0, the listing for KB1 includes the notation PK0:.

The final column contains comments about the unit. The comment DISABLED means that the unit is not available for use during timesharing. For keyboards, the comment MODEM means that modem control is enabled for that unit. For line printers, the third column includes the printer type (LP, LV, or LS) and width. If the line printer is lower case, this column also includes the comment LOWER CASE. The comment PRIVILEGED appears for device units that are accessible only to privileged jobs or programs.

3.9.2 Enabling and Disabling Modem Control

The MODEM suboption allows you to enable and the LOCAL suboption allows you to disable modem control on keyboards controlled by a DH11 or DZ11 multiplexer.

To enable modem control, use the MODEM suboption. In response to MODEM's KB? query, type the keyboard number or range of keyboard numbers for which modem control should be enabled. To exit from the suboption, type the LINE FEED key or CTRL/Z. The following example illustrates the use of the MODEM suboption.

```
SET suboption? MODEM
KB? 27-30
KB? (LF)

SET suboption?
```

To disable modem control, use the LOCAL suboption. The format and exit procedures for LOCAL are the same as those for MODEM.

3.9.3 Changing Line Printer Unit Characteristics

Use the LP suboption to change the printer type, width, and case associated with any line printer unit on the system. The suboption requests the unit number (if the system includes more than one line printer) for which changes will be made, then prompts you for printer type, width, and case for that unit. Each prompt includes in parentheses the current setting for that characteristic.

The line printer type can be LP, LS, or LV. If the line printer is not a standard DIGITAL line printer, you can set individual characteristics for it as described in Table 3-23.

Table 3-23
Line Printer Characteristics

Name	Function
OMITCR	Omits sending a RETURN character if the next character is LINE FEED
CR	Ensures that a RETURN character precedes each LINE FEED, FORM FEED, or VERTICAL TAB character
EOT	Prints EOT (CTRL/D)
FILL	Inserts a fill character after each form feed
CONTROL	Prints characters that normally cannot be printed, such as control characters
VTAB	Prints vertical tabs

You can negate the effect of any of the characteristics by typing NO before its name, as in NOOMITCR, NOCR, NOEOT, NOFILL, NOCONTROL, and NOVTAB. The default settings are NOOMITCR, CR, NOEOT, FILL, NOCONTROL, and NOVTAB. Respond to the TYPE? query with a DIGITAL printer type or one or more individual characteristics.

The width setting for the line printer is a decimal number between 1 and 254, inclusive. The default width is 80 columns, if none is specified with the LP suboption. The case setting is upper or lower case. The default setting is upper case only. After you set all characteristics for a printer unit, the suboption returns to the LP? query. (If only one

printer is on the system, the suboption does not return to LP? but exits to the SET SUBOPTION? query.) Type a unit number to set characteristics for another unit; type the LINE FEED key to exit from the suboption. The following is an example of the LP suboption:

```
SET suboption? LP

Unit? 0
Type (NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB)? LP
Width (80)? 132
Lower case (no)? Y

Unit? 1
Type (NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB)? LP
Width (80)? (LF)
Lower case (no)? Y

Unit? (LF)

SET suboption?
```

3.9.4 Enabling and Disabling Device Units

The ENABLE and DISABLE suboptions allow you to make device units available or unavailable for timesharing use. A timesharing user who attempts to access a unit disabled with the DISABLE suboption receives the ?DEVICE NOT AVAILABLE error message.

The DISABLE suboption of SET differs from that of the HARDWR option in that SET allows you to disable a single unit on a controller without affecting any other units of the same type. HARDWR permits disabling of device controllers only.

Use SET's DISABLE suboption when a particular unit has hardware problems. If you disable the troublesome unit, timesharing can take place while the unit is being repaired. When the unit is working properly, reboot the system and reenable the unit.

DISABLE and ENABLE also, in effect, allow you to configure a device unit that is not yet installed in the processor. You can include the unit at configuration time and disable it until it is installed. After its installation, you can enable it for timesharing use. Disabling nonexistent units with the SET option suppresses the warning messages generated when the start-up code automatically disables them.

To enable or disable a unit, type the appropriate suboption name (ENABLE or DISABLE, respectively). In response, the suboption poses the DEVICE? query. You can disable any device unit except the console keyboard (KB0:). To enable or disable only one unit or range of units of a device, type the device name followed by the unit number or numbers, as in KB10 or KB8-12. The suboption makes the specified change and returns to the DEVICE? question. To enable or disable several units of a single device, type only the device name in response to the query. The suboption next prompts with UNIT?. Reply with a number or range of numbers for the units to enable or disable. For the ENABLE suboption only, you can type ALL to enable all units of that device. The suboption makes the specified changes and repeats the query. Specify another unit or range of units or press the LINE FEED key to return to the DEVICE? query.

Once you are at the DEVICE? query, you can type another device name to enable or disable additional device units, or you can press the LINE FEED key to return to the SET SUBOPTION? question.

The following example demonstrates the DISABLE suboption. The dialogue for the ENABLE suboption is exactly the same.

```
SET suboption? DISABLE
Device? KB
Unit? 8-12
Unit? <LF>
Device? <LF>

SET suboption?
```

3.9.5 Restricting the Use of Devices

The PRIV and UNPRIV suboptions allow you to place and remove restrictions on the use of devices and device units on the RSTS/E system. RSTS/E timesharing normally allows any user job to use any device.

By using the PRIV suboption, you can permit only certain jobs to use specified devices. A permanently privileged user (one whose project number is 1) can use any restricted device and can reassign a restricted device to an unprivileged job. An unprivileged job gains ownership of a restricted device by running a privileged program that assigns the device or by having a privileged job reassign the device to it. The unprivileged job loses ownership of the device when it logs out or issues a DEASSIGN command. An unprivileged job can also gain access to a restricted device by running a privileged program that uses the device. If the program does not assign the device, the job has access to the device only while the privileged program executes. When execution of the program is complete, the device is once again inaccessible to the job.

You can restrict the use of any device except disks and the null device. Restrictions on keyboard access do not prevent jobs from logging in. Any job can log in to a restricted keyboard. The restrictions prevent an unprivileged job from opening or assigning a keyboard other than its console keyboard (KB:).

To place or remove restrictions on the use of one or more devices, use the PRIV or UNPRIV suboption. In response to the SET SUBOPTION? question, type the name of the suboption you need to use. The suboption then prints the DEVICE? question. Type the name of the device for which you need to set or remove restrictions. (When using the UNPRIV suboption, you can type ALL in response to the DEVICE? query to free access to all devices. UNPRIV then returns to the SET SUBOPTION? query.) After you specify a device name, the suboption prints the UNIT? question. Respond by typing a unit number, range of unit numbers, or ALL. The suboption enacts the requested changes and repeats the UNIT? question. Type another unit number or range of unit numbers, or press the LINE FEED key to return to the DEVICE? question. To set or remove restrictions for another device, type the name of the device. Press the LINE FEED key to return to the SET SUBOPTION? question.

The following example shows the use of PRIV to make the use of keyboards a privileged operation.

```
Option: SE

  SET suboption? PRIV
  Device? KB
  Unit? ALL
  Device? <LF>

  SET suboption? <LF>


Option:
```

3.9.6 SET Option Dialogue Error Messages

Table 3-24 summarizes the errors that can occur during the SET option dialogue.

Table 3-24
SET Dialogue Error Messages

Message	Suboption	Meaning
CAN'T DISABLE KB0:	DISABLE	You specified KB0:, which cannot be disabled.
INVALID KEYBOARD NUMBER	MODEM, LOCAL	The keyboard number you typed is greater than the maximum allowed.
INVALID RESPONSE	MODEM, LOCAL, LP	The number you typed is in an incorrect format.
	ENABLE, DISABLE, PRIV, UNPRIV	The device you specified is not configured in the installed monitor SIL. Use the LIST suboption to obtain a list of valid device names.
INVALID UNIT NUMBER	ENABLE, DISABLE, LP, PRIV, UNPRIV	The unit number you typed is not a decimal number, or is too large for the installed SIL. If you typed a range of unit numbers, they must be in ascending order.
KBnn: CANNOT HAVE MODEM CONTROL	MODEM	KBnn: is not on a DH11 or DZ11 interface. Therefore, it cannot have modem control.
NOT POSSIBLE ON DISK UNIT	PRIV, UNPRIV	You cannot use PRIV or UNPRIV on a disk device.

Table 3-24 describes only the errors that can occur during the SET option dialogue. For information on other errors that can occur with the SET option, refer to Appendix B.

3.10 STARTING TIMESHARING

Use the START option to start the RSTS/E system for normal timesharing. The START option allows you to change job and swap maximums, memory allocation, and crash dumps. However, any changes made with START override the DEFAULT settings for only one timesharing session. After that timesharing session, the DEFAULT settings again apply. You can make permanent changes in the defaults only by using the DEFAULT option.

To invoke the START option, type START, ST, or the LINE FEED key. START or ST causes the initialization code to print the start-up questions (which allow you to override DEFAULT parameters) and a list of the disabled devices. If you press the LINE FEED key, the initialization code omits the questions, preventing you from overriding any defaults. When you press the LINE FEED key to start the system, the initialization code prints a summary of the system defaults, requests the date and time, and then prints the number of disabled devices. The following sample dialogue shows the normal procedure for starting a RSTS/E SYSGEN system.

```
Option: ST

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes? LF

Any memory allocation changes? LF

You currently have crash dump enabled.

Crash dump? LF

30-SEP-76? LF
18:45? LF
DF0: disabled - no RF: controller
DM0: disabled - no RM: controller
DM1: disabled - no RM: controller
MT0: disabled - no TM: controller
MT1: disabled - no TM: controller

5 devices disabled

?Can't find file or account
.
```

In the example, the answer to each query is the LINE FEED key. By pressing the LINE FEED key, you accept the parameters you set with the DEFAULT option. Accepting the defaults is the normal start-up procedure. You can accept the current values for date and time, as well, by pressing the LINE FEED key.

After the system accepts your responses, a pause of several seconds occurs. During this time, the start-up routines enable all configured terminal interfaces, set up monitor tables, turn on memory management, load the monitor and default run-time system, and start the system clock. Finally, the system attempts to execute the INIT system program (described in Section 3.1 of the RSTS/E System Manager's Guide). When you bring up a new system for the first time, the INIT system program is not yet in the system library. As a result, the system generates the ?CAN'T FIND FILE OR ACCOUNT error message. If the default run-time system is BASIC-PLUS, the ?PROGRAM LOST–SORRY message also appears. The printing of a dot (.) for the SYSGEN system or the READY message for the target system (if its default run-time system is BASIC-PLUS) signals the end of the system initialization code routines.

3.10.1 Hardware Messages at Start-Up

The start-up code checks the system to verify that all configured devices exist and that they respond properly. The code disables any device that it cannot find or that you have disabled with the SET or HARDWR option. START accesses all configured terminal interfaces and disables any that do not respond. It activates the memory management unit to determine the size of available memory (as in DEFAULT), to load the monitor and default run-time system, and to prepare for normal timesharing. START, furthermore, loads the stack limit register, enables parity traps for all parity memory, and activates the system clock to begin timesharing. If the system does not start as shown in the examples, these components are suspect and should be exercised with the standard diagnostics.

3.10.2 Software Messages at Start-Up

In addition to hardware checks, START verifies that the required system files exist and are of the proper sizes.

If the file SWAP.SYS does not exist, is not contiguous, or is too small to accommodate two jobs of size SWAP MAX, START routines print one of the following messages:

```
SWAP.SYS not contiguous or too small

SWAP.SYS not present in [0,1]
```

If you enabled crash dumps (with either the DEFAULT option or the START option), START routines check that the file CRASH.SYS is present in account [0, 1] on the system disk, is large enough for the current monitor, and is contiguous on the disk. If the file does not meet all these conditions, START prints one of the following error messages:

```
CRASH.SYS does not exist

CRASH.SYS file of nnn blocks is not available

CRASH.SYS is not contiguous
```

In the second message, nnn indicates the number of blocks necessary for a monitor dump. The error message is followed by the text:

```
Crash dump automatically disabled
```

3.11 BOOTSTRAPPING DEVICES

The BOOT option, which simulates the hardware ROM bootstraps, allows you to bootstrap tape and disk devices. You can use BOOT to load another operating system into memory from disk or tape and to reload an altered copy of the initialization code after you have patched it on disk.

To run BOOT, type BOOT or BO in response to the OPTION: prompt. BOOT responds by asking for the device to bootstrap. In response, type either the device name or the RETURN key (for a list of bootable devices). If the device has unit numbers (all devices except DC and DF), you can append the unit number to the device name. (If you do not include the unit number in this response, BOOT requests it later, with the BOOT UNIT: prompt.) Any unit can be bootstrapped.

If you press the LINE FEED key, the system device is bootstrapped. The BOOT option automatically determines the system device and unit number, so the BOOT UNIT: prompt does not appear. This facility is useful for loading a patched version of the initialization code.

The following example illustrates the use of the option.

```
Option: BOOT
  Boot device: DK
  Boot unit: 0


RSTS/E V06B-02 System #144 (DK0)


Option:
```

After determining that the specified device exists, BOOT waits for the terminal to stop printing, then jumps to a device-dependent routine. It reads the device's bootstrap block into location 0, then transfers control to location 0.

The following table explains the error messages that can appear during the BOOT option dialogue.

Table 3-25
BOOT Dialogue Error Messages

Message	Meaning
NOT A VALID BOOT DEVICE	The device you named is not a valid bootable device or you specified a unit number for a DC or DF disk. Type the RETURN key for a list of devices that can be bootstrapped.
SORRY, BUT THAT DEVICE DOESN'T EXIST	The device name you typed is valid, but the device does not exist on this PDP-11.

For information on other error messages that appear during use of the BOOT option, refer to Appendix B.

3.12 LOADING STAND-ALONE PROGRAMS

Use the LOAD option to load and run any stand-alone program from account [0, 1] on the system disk. You can use LOAD only if the system device is disk. The program to be loaded must have the extension .SAV and must not require RSTS/E monitor support. The only stand-alone program that DIGITAL supplies is ROLLIN.

To run LOAD, type LOAD or LO in response to the OPTION: prompt. If you press the RETURN key in answer to the first question, LOAD lists the loadable programs. The following is a sample dialogue:

```
Option: LOAD
Load program: ROLLIN


ROLLIN V07


*
```

If the program you specify has an odd transfer address, or if the transfer address is greater than the size of the program, LOAD prints the following message:

```
Odd transfer address?
```

If you press RETURN in response to this question, LOAD prints the longer message:

```
The transfer address of the specified program is odd.
Please enter a new (even) transfer address or type
CONTROL/C to abort the load.  New transfer address?
```

The program to be loaded must have an even (word) octal transfer address because the PDP-11 traps to an error vector if you specify an odd (byte) address. Therefore, type an even address at which the system should start the program.

If you enter a legal transfer address, the system loads the designated program into memory and starts execution of it. When execution of the program is complete, you can restore RSTS/E by following the appropriate bootstrap procedures.

Error messages that can appear during the LOAD option dialogue are explained in Table 3-26.

Table 3-26
LOAD Dialogue Error Messages

Message	Meaning
DIRECTORY ERROR – FILE NOT FOUND	The directory lookup code in the LOAD option found the file you specified, but the file processor code did not. This error indicates a bug in the initialization code. You should submit an SPR.
ILLEGAL PROGRAM NAME	The program name you typed is in an incorrect format. The name must be one to six alphanumeric characters with no embedded spaces.
PROGRAM NOT FOUND	The program you specified could not be found. Type the RETURN key to get a list of programs that can be loaded.

For information on other errors that occur during the use of the LOAD option, refer to Appendix B.

3.13 ENABLING ONLY THE CONSOLE TERMINAL

The UNISYS option provides a way to start the RSTS/E system for timesharing without enabling any terminal interfaces except the console (KB0:) interface. Use UNISYS as a diagnostic tool in cases where the system will not start. If an otherwise nonworking system does work with UNISYS, the terminal configuration is probably faulty.

The UNISYS option simply sets a flag that is checked at start-up time. When the flag is set, the start-up routines bypass the code that enables terminal interfaces. The only way to clear the flag is to reboot the RSTS/E system disk, thus reloading the initialization code. (See the description of bootstrapping devices in Section 3.11.) Therefore, use UNISYS immediately before starting the system. The following shows the use of the UNISYS option.

```
Option: UNISYS

Option: START

You currently have: JOB MAX = 24, SWAP MAX = 16K.

JOB MAX or SWAP MAX changes? <LF>

Any memory allocation changes? <LF>

You currently have crash dump enabled.

Crash dump? <LF>

14-OCT-76? <LF>
19:58? <LF>
All except console terminal being disabled.
?Can't find file or account
?Program lost-Sorry

Ready
```

In the example, the user specifies the UNISYS and START options. The START option asks the usual questions, then prints a message indicating that only the console terminal is enabled.

3.14 SETTING CONSOLE TERMINAL FILL CHARACTERISTICS

The FILL option sets fill characteristics for the console terminal. The characteristics set by FILL are in effect only while the initialization code is running. If the initialization code is running from tape, the settings remain only until you reboot the initialization code. If the initialization code is running from disk, the characteristics remain set when you reboot the initialization code. When you start timesharing, however, the characteristics are no longer in effect.

To invoke the FILL option, type FILL or FI in response to the OPTION: prompt. Valid responses are 0-7 and LA30S. Table 3-27 lists the responses recommended for DIGITAL terminals.

Table 3-27
Recommended Console Terminal Fill Characteristics

Fill Characteristic		Terminal
0		ASR33, KSR33, VT05, LA30, VT50, VT52, LA36
1		ASR35, KSR35
3		VT05B
LA30S		LA30S

To set fill characteristics for use during timesharing, use the appropriate TTYSET commands in the START.CTL and CRASH.CTL control files. For more information on TTYSET and control files, see the RSTS/E System Manager's Guide, Sections 3.1 and 7.4, respectively.

3.15 SUMMARY OF PROCEDURES

This section summarizes the procedures you must follow to tailor the SYSGEN system. Figure 3-2 illustrates the flow of the procedures.

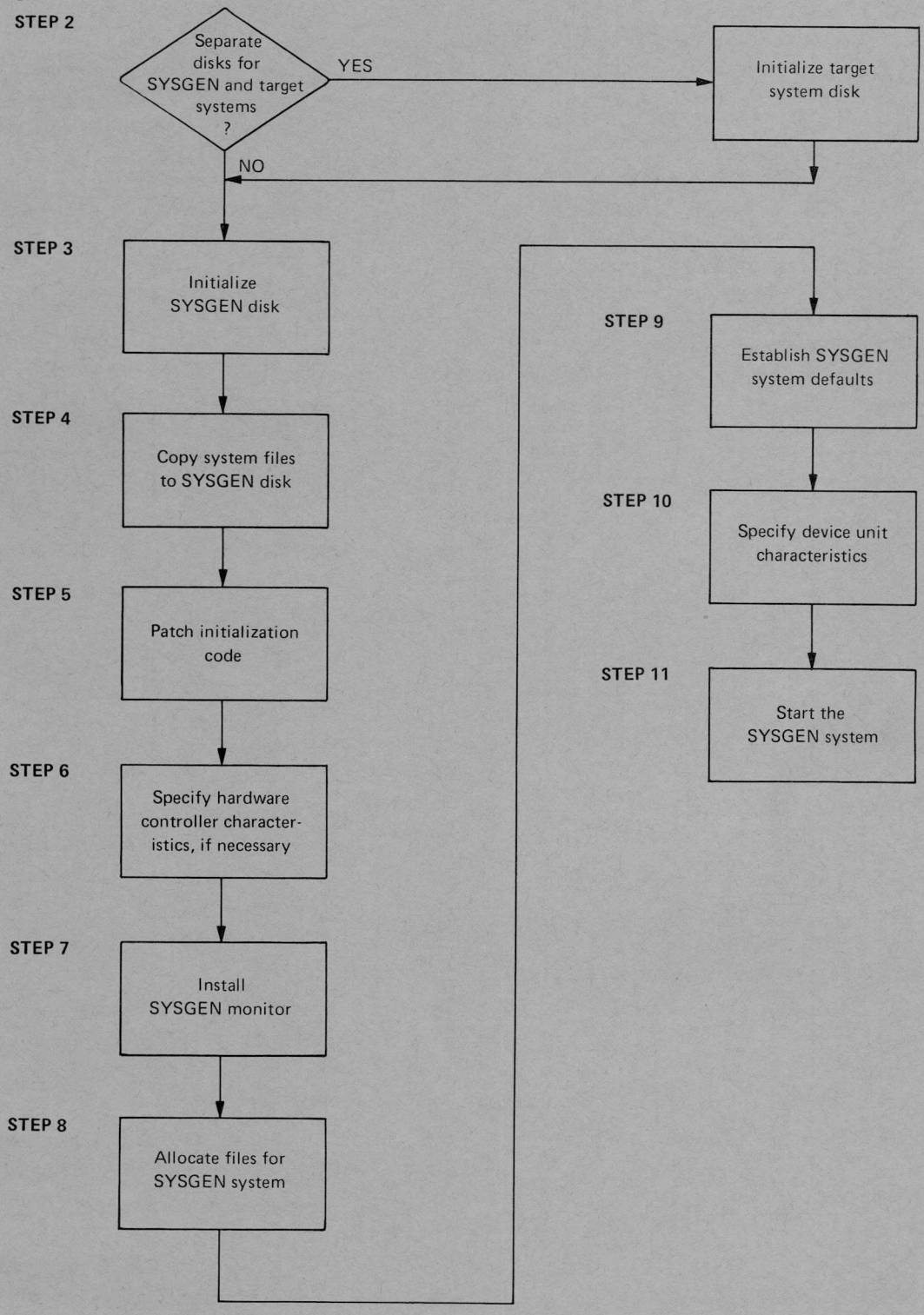

Figure 3-2 Summary of Tailoring Procedures for the SYSGEN System

STEP 2. Initializing a Disk for the Target System

Follow the procedure in this step if the following two conditions are true:

- You plan to use separate disks for the SYSGEN and target systems
- The target system disk does not contain data that you need to preserve

Procedure:

a. Physically mount the disk you plan to use as the target system disk.
b. Use the DSKINT option to initialize the disk as a system disk. Note that initialization destroys any data on the disk. Table 3-28 summarizes the DSKINT option dialogue. Refer to Section 3.2 for complete information on the DSKINT option.
c. Dismount the newly initialized disk if you need the disk drive for the SYSGEN system disk.

Table 3-28
Summary of DSKINT Option

Question	Possible Responses
DD-MMM-YY?	Current date. Press LINE FEED to accept the date printed.
HH:MM?	Current time. Press LINE FEED to accept the time printed.
DISK?	DC, DF, DS, DK, DM, DP, or DB
UNIT?	0-7 (asked for multi-unit controllers only)
PLATTERS(n)?	1-8 for DF disks 1-4 for DC disks Press LINE FEED to use the number in parentheses. (asked for DC and DF disks only)
PACK ID?	One to six alphanumeric characters
PACK CLUSTER SIZE?	1, 2, 4, 8, or 16 for RS11, RS64, RS03, RS04, RK05, RK05F, and RK06 disks 2, 4, 8, or 16 for RP02 and RP03 disks 4, 8, or 16 for RP04 and RP05 disks 8 or 16 for RP06 disks
SATT.SYS BASE?	A number from 1 to (disk size - 1). Press the LINE FEED key to let DSKINT place SATT.SYS at the first available space.
MFD PASSWORD?	One to six alphanumeric characters
MFD CLUSTER SIZE?	A power of two not less than the pack cluster size and not greater than 16
PUB, PRI, OR SYS?	PUB for a public disk PRI for a private disk SYS for a system disk
CREATE LIBRARY ACCOUNT?	Y or N (N skips the next two questions.)

Table 3-28 (Cont.)
Summary of DSKINT Option

Question	Possible Responses
LIBRARY PASSWORD?	One to six alphanumeric characters
LIBRARY UFD CLUSTER SIZE?	A power of two not less than the pack cluster size and not greater than 16. The library UFD cluster size must be at least 4.
DATE LAST MODIFIED?	Y or N
FORMAT?	Y or N
PATTERNS?	1-8. Append X to specify up to eight of your own patterns in addition to the standard patterns.
YOUR PATTERN?	An octal word from 1 to 177777. Press LINE FEED to indicate no more patterns. (Asked only if you appended X to the previous response.)
PROCEED (Y OR N)?	Y or N

STEP 3. Initializing the SYSGEN System Disk

Procedure:

a. If the SYSGEN system disk will be a moving-head device, mount it.
b. Use the DSKINT option to initialize the disk as a system disk. Refer to Summary Table 3-28 or Section 3.2 for more information.

STEP 4. Copying System Files to the SYSGEN Disk

Procedure:

Use the COPY option to copy RSTS/E system files to the SYSGEN system disk. Summary Table 3-29 contains questions and appropriate responses for this use of COPY. For further information on the COPY option, refer to Section 3.3.

Table 3-29
Summary of COPY Option

Question	Possible Response
DD-MMM-YY?	Current date or LINE FEED to accept the date printed.
HH:MM?	Current time or LINE FEED to accept the time printed.
TO WHICH DISK?	DC, DF, DS, DK, DM, DP or DB
UNIT?	0-7 (asked for multi-unit controllers only)

STEP 5. Correcting the System Code

Procedure:

a. Gather the RSTS/E Release Notes, the Software Dispatch, and any other published patches your system requires.
b. Follow the instructions in the published patches for patching the system initialization code. Refer to Section 3.4 for further information on the PATCH option.
c. If the instructions in the published patch direct you to rebootstrap the system, use the BOOT option (described in Section 3.11) to do so.

STEP 6. Specifying Hardware Controller Characteristics

Follow the procedure in this step if one or both of the following conditions are true:

- You are installing new hardware and need to ascertain the configuration. (Usually, DIGITAL Field Service personnel do this.)
- At system installation, a DIGITAL Field Service representative had to make software changes to the hardware configuration, and these changes must also be applied to the system you are now generating.

Procedure:

Use the HARDWR option to check the hardware configuration. For new hardware, list the hardware configuration and correct it if necessary. If you are regenerating an existing system, make any changes necessary for this system. Summary Table 3-30 contains information on the HARDWR option and its suboptions. For complete information, refer to Section 3.5.

Table 3-30
Summary of HARDWR Option

Question	Possible Responses
HARDWR SUBOPTION?	LIST DISABLE ENABLE CSR VECTOR DM RESET EXIT (applies changes and returns to OPTION:) CTRL/C (applies no changes and returns to OPTION:) You can abbreviate the names to their first 2 characters.
LIST Suboption:	
The LIST suboption does not ask questions.	
DISABLE Suboption:	
CONTROLLER TO DISABLE?	Controller name. Type ? for a list of controller names.
ENABLE Suboption:	
CONTROLLER TO ENABLE?	Controller name. Type ? for a list of controller names.
CSR Suboption:	
CONTROLLER WITH NON-STANDARD ADDRESS?	Controller name. Type ? for a list of controller names.
NEW CONTROLLER ADDRESS?	Type an even octal address greater than 160000. Type RE to remove a nonstandard address. Type CTRL/Z to return to HARDWR SUBOPTION? without specifying a new address.
VECTOR Suboption:	
CONTROLLER WITH NON-STANDARD VECTOR?	Controller name. Type ? for a list of controller names.
NEW VECTOR ADDRESS?	Type an even octal address from 0 to 776. Type RE to remove a nonstandard vector. Type CTRL/Z to return to HARDWR SUBOPTION? without specifying a new vector.
DM Suboption:	
DH for DMn (xxx)?	Type the DH11 unit number. Press LINE FEED to accept the current setting of xxx. Type CTRL/Z to return to the HARDWR SUBOPTION? question.
RESET Suboption:	
The RESET suboption does not ask questions.	

STEP 7. Installing the SYSGEN System Monitor

Procedure:

a. Use the INSTALL option to install the monitor. Type SYSGEN in response to the question SIL? Refer to Section 3.6 for further information on the INSTALL option.
b. Follow the instructions in the RSTS/E Release Notes and published patches to patch the SYSGEN monitor SIL.

STEP 8. Allocating Files for the SYSGEN System

Procedure:

Use the REFRESH option to allocate the necessary files. Summary Table 3-31 contains questions and appropriate responses for this use of REFRESH. Refer to Section 3.7 for further information on REFRESH.

Table 3-31
Summary of REFRESH Option

Question	Possible Responses
DD-MMM-YY?	Current date. Press the LINE FEED key to accept the date printed.
HH:MM?	Current time. Press the LINE FEED key to accept the time printed.
DISK?	DC, DF, DS, DK, DM, DP, or DB. Press the LINE FEED key to REFRESH the system disk.
UNIT?	0-3 for DC disks 0-7 for all other disks
CLEAN?	Y to clean the disk. N or LINE FEED to omit the cleaning operation.
REFRESH SUBOPTION?	LIST, CHANGE, FILE, or BADS. Type EXIT or press the LINE FEED key to return to the OPTION: prompt.
LIST Suboption:	
The LIST suboption does not ask questions.	
CHANGE Suboption:	
filnam.ext CHANGES?	Y or N. Type CTRL/Z to return to the REFRESH SUBOPTION? query. Asked for the following files, in order: SWAP.SYS, SWAP0.SYS, SWAP1.SYS, SWAP3.SYS, OVR.SYS, ERR.SYS, BUFF.SYS, and CRASH.SYS. If you answer Y to filnam.ext CHANGES? for any file, the CHANGE suboption asks the DELETE?, SIZE?, and BASE? questions for that file. After you have answered the filnam.ext CHANGES? question for each of the listed files, the suboption asks the OTHER FILES? question.

Table 3-31 (Cont.)
Summary of REFRESH Option

Question	Possible Responses
DELETE?	Y or N. (Asked only if the file exists.) Type CTRL/Z to return to filnam.ext CHANGES? for the current file.
SIZE?	A decimal number of blocks. For the SYSGEN system, the size of SWAP.SYS must be at least 208 blocks for a 48K word system and 224 blocks for all other systems. Type CTRL/Z to return to filnam.ext CHANGES? for the current file.
BASE?	The decimal number of the logical block at which you prefer to start the file. Type OLD or the LINE FEED key to retain the file at its current starting location. Type 0 to place the file at the first available space. Type CTRL/Z to return to the filnam.ext CHANGES? question for the current file.
OTHER FILES?	Type a filename and extension to change another file in account [0, 1]. The suboption then asks the DELETE?, SIZE, and BASE? questions. Type N or LINE FEED to omit changes to other files.
FILE Suboption:	
FILE NAME?	Filename and extension
FILE EXISTS. DELETE IT?	Y or N. Type CTRL/Z to return to the FILE NAME? question.
SIZE?	A decimal number of blocks. Type CTRL/Z to return to the FILE NAME? question.
BASE?	The decimal number of the logical block at which you prefer to start the file. Type OLD or the LINE FEED key to retain the file at its current starting location. Type 0 to place the file at the first available space. Type CTRL/Z to return to the FILE NAME? question.
DELETABLE?	Y or N. Press the LINE FEED key for no change. Type CTRL/Z to return to the FILE NAME? question.
BADS Suboption:	
BADS?	Type LIST for a list of bad blocks in the bad block file. Type ADD to add bad blocks to the bad block file. Type EXIT or the LINE FEED key to return to the REFRESH SUBOPTION? query.
BLOCK NUMBER?	(Asked only if you answered ADD to the BADS? query.) Type a logical block number (in decimal) between 1 and the disk size minus 1.
REALLY ADD LOGICAL BLOCK nn TO BADB.SYS?	Y or N

STEP 9. Setting Defaults for the SYSGEN System

Procedure:

Use the DEFAULT option to set defaults. Summary Table 3-32 contains the questions and appropriate responses for this use of the DEFAULT option. Refer to Section 3.8 for further information on the DEFAULT option.

Table 3-32
Summary of DEFAULT Option

Question	Possible Responses
JOB MAX OR SWAP MAX CHANGES?	Y
NEW JOB MAX?	2
NEW SWAP MAX?	26 for a 48K word system 28 for all other systems
RUN-TIME SYSTEM?	RT11
ERROR MESSAGE FILE?	ERR
INSTALLATION NAME?	1-14 printable characters including spaces
ANY MEMORY ALLOCATION CHANGES? CHANGES?	Y or N
TABLE SUBOPTION?	LIST, PARITY, RESET, LOCK, UNLOCK, RTS, XBUF Type EXIT or the LINE FEED key to proceed to the CRASH DUMP? question. An address typed in response to any of the following questions can be expressed either as an absolute octal address or as a decimal integer followed by the letter K. To name a range of addresses, type two addresses in the specified format, separated by a hyphen. Legal addresses are, for example, 00577777, 21K, 00130000-00137777, and 18K-23K.
LIST, PARITY, and RESET Table Suboptions:	
These suboptions do not ask any questions.	
LOCK Table Suboption:	
LOCK ADDRESS IS?	Address or range of addresses
UNLOCK Table Suboption:	
UNLOCK ADDRESS IS?	Address or range of addresses
RTS Table Suboption:	
NEW RUN TIME SYSTEM ADDRESS IS?	Starting address
XBUF Table Suboption:	
EXTENDED BUFFER SPACE ADDRESS RANGE IS?	Address or range of addresses
CRASH DUMP?	Y or N
MAGTAPE LABELLING DEFAULT?	DOS

STEP 10. Specifying Device Unit Characteristics for the SYSGEN System

Procedure:

Use the SET option to specify characteristics. Summary Table 3-33 contains the questions and possible responses for the SET option. Refer to Section 3.9 for further information on SET.

Table 3-33
Summary of SET Option

Question	Possible Responses
SET SUBOPTION?	LIST, MODEM, LOCAL, LP, DISABLE, ENABLE, PRIV, UNPRIV. Type EXIT or the LINE FEED key to return to the OPTION: prompt.
LIST Suboption:	
DEVICE?	Type a device name; device name and unit number; device name and two unit numbers for a range of devices (for example, KB1-6); or press the LINE FEED key to list all devices
MODEM and LOCAL Suboptions:	
KB?	Type a decimal number between 0 and the highest numbered keyboard or a range of decimal keyboard numbers.
LP Suboption:	
UNIT?	Decimal unit number. Not asked if only one is present.
TYPE (xx)?	LP, LV, LS. Press LINE FEED to accept the setting in parentheses. Press RETURN to print the characteristics associated with LP, LV, and LS.
WIDTH (n)?	Type a decimal number between 1 and 254 or press the LINE FEED key to accept the setting in parentheses. Common widths are 80 and 132 characters.
LOWER CASE (x)?	Y or N. Press LINE FEED to accept the setting in parentheses.
ENABLE and DISABLE Suboptions:	
DEVICE?	Type a device name or a device name followed by unit number. For ENABLE suboption only, type ALL to enable all devices.
UNIT?	Type a unit number in decimal or two unit numbers separated by a hyphen. Type ALL to enable or disable all units of a device. This question is not asked if you specify a unit number in response to the previous question.
PRIV and UNPRIV Suboptions:	
DEVICE?	Type a device name or device name followed by unit number. For the UNPRIV suboption only, type ALL to free access to all devices.
UNIT?	Type a unit number in decimal or two unit numbers separated by a hyphen. Type ALL to restrict or free access to all units of the device.

STEP 11. Starting the SYSGEN System

Procedure:

Use the START option to start the SYSGEN system. To invoke the option, type START or ST. Refer to Section 3.10 for information on start-up messages and errors. The SYSGEN system is configured for many devices that may not exist on your computer. Therefore, the initialization code normally disables the non-existent devices when it starts the system.

CHAPTER 4
GENERATING THE TARGET SYSTEM

After tailoring the SYSGEN system, your next step in the system generation procedure is generating the target system. The generation of the target system involves 1) running the program CREATE.SAV, 2) answering the system configuration questions, 3) running the program SYSBAT.SAV, and 4) shutting down the SYSGEN system.

The program CREATE.SAV includes a batch stream that copies several files to the SYSGEN disk. These files are used in generating the RSTS/E monitor and BASIC-PLUS run-time system. After copying the files, CREATE.SAV chains to the SYSGEN program, which asks the configuration questions.

Your answers to the configuration questions establish the hardware devices and optional software elements that the target system will support.

After answering the configuration questions, run the SYSBAT.SAV program. SYSBAT.SAV runs a batch file containing commands that cause the assembling of the monitor terminal drivers and system tables and the linking of the target system monitor and BASIC-PLUS run-time system. When the execution of SYSBAT.SAV is complete, shut down the SYSGEN system and proceed to Chapter 5 to tailor the target system.

NOTE

All filename extensions in this chapter are .SAV, if not explicitly stated.

4.1 RUNNING THE PROGRAM CREATE.SAV

The program CREATE.SAV includes a batch stream that 1) enables logins and 2) copies the files needed for target system generation to the SYSGEN disk. CREATE.SAV then chains to the SYSGEN program, which asks the configuration questions.

If your distribution medium is disk cartridge, logically mount it before running CREATE.SAV. Ensure that the disk drive is write protected. Use a command of the following form:

```
.MOUNT dev:ORSPAE/RO
```

Replace dev in the example with the device name (DK or DM) and unit number of the distribution disk. The /RO switch mounts the disk for read access only to prevent accidental destruction of data on the disk.

Start the execution of CREATE.SAV by typing the following command:

```
.R dev:CREATE.SAV
```

Replace dev in the command with the device name and unit number of the distribution medium. For DECtape distribution, specify the tape on DT1:. The program first enables logins for the SYSGEN system. Second, it copies the LOGIN.SAV program from the distribution medium to the SYSGEN disk. Third, it logs in on a pseudo keyboard under account [1,2] and uses PIP to copy the following files to the SYSGEN disk from the distribution medium:

LOGOUT
PIP
UTILTY
MACRO
CREF
LINK
SILUS
HOOK
SYSGEN
SYSBAT
ERR.STB

The programs LOGOUT, PIP, and UTILTY are special versions of system programs that run under the RT11 run-time system and are necessary for system generation. Note that they do not necessarily accept the same commands as the BASIC-PLUS LOGOUT, PIP, and UTILTY programs.

The files MACRO, CREF, LINK, SILUS, HOOK, and ERR.STB are used later in the actual generation of the RSTS/E monitor and BASIC-PLUS run-time system. MACRO assembles TBL and TTDVR, which are the system table and terminal service modules. All other system modules are assembled at DIGITAL before they are shipped. CREF generates the cross reference table that appears at the end of each assembly listing. LINK links modules of both the RSTS/E monitor and the BASIC-PLUS run-time system. SILUS creates correctly formatted Save Image Library files. HOOK makes the disk or tape that is output from the system generation process capable of being bootstrapped. ERR.STB defines the error symbols for the monitor and run-time system links.

The SYSGEN program asks the configuration questions.

SYSBAT is the program which, later in the generation process, interprets a batch file containing commands that run the preceding programs in order to generate the monitor and/or BASIC-PLUS run-time system.

CREATE.SAV generates a log file, named CREATE.LOG, on the system disk under the logged in account (normally [1,2]). In addition, it prints all the pseudo keyboard input and output on the console terminal (KB0:), indented two spaces from the left margin.

After CREATE.SAV copies all the necessary files, it logically dismounts the distribution disk (if the distribution medium is disk) and chains to the SYSGEN program.

4.2 ANSWERING THE CONFIGURATION QUESTIONS

The SYSGEN program automatically answers the configuration questions by printing a response (RES) in one of the three forms shown in Table 4-1.

Table 4-1
Automatic Answer Formats

Answer	Reason
RES	The program has ascertained that RES is the correct response.
#RES#	The program assumes that RES is the correct response.
#??#	The program does not know and cannot guess the correct response.

To accept the automatic answer, press the LINE FEED key. To override the automatic answer, type a response followed by the RETURN key. To obtain an explanatory form of the question, press only the RETURN key. If you need to return to an earlier question, press the ESC key (shown as ALT MODE on some terminals). Table 4-2 summarizes the possible responses to a configuration question.

Table 4-2
Possible Responses to Configuration Questions

Response	Meaning
<string>	<string> is the desired answer.
RETURN key	Print the long, explanatory form of the question.
LINE FEED key	Accept the automatic answer for the question. Not valid if the automatic answer is #??#.
ESC key	Return to the preceding question or to the first question in this sequence.

By using the ESC key, you can return to the previous question or to an earlier question in the current sequence. For example, pressing ESC in response to the RK05'S question returns you to the previous question, RS03/RS04'S. Within a sequence of questions, ESC causes a return to the first question in the sequence. As an example, pressing ESC in response to the DATASET SUPPORT FOR DH11'S question backs up to the DH11'S question. You cannot back up beyond certain configuration questions, which delimit sections of the configuration dialogue. These questions are as follows:

KL11, LC11, DL11A, DL11B'S?
RC11/RS64'S?
TU16'S?
RX01'S?
MAXIMUM JOBS?
FPP?

If you press ESC in response to any of the listed questions, the SYSGEN program reprints the question.

The SYSGEN program uses the responses to the configuration questions to create a batch file, SYSGEN.CTL. If you are generating a monitor, the file CONFIG.MAC is also created. CONFIG.MAC defines assembly parameters for the target monitor. The SYSBAT program uses the SYSGEN.CTL file to perform the requested generation. The remainder of this section describes the configuration questions in detail.

4.2.1 Preliminary Considerations

The system can print the configuration questions in either a short form or a long form. The short form questions are merely a brief prompt. The long form questions include helpful information. If you specify the short form questions, you can request the long form for any question by pressing the RETURN key in response to the short form prompt.

You can generate RSTS/E for the computer on which you are working or for another computer. If you specify that you are generating RSTS/E for another computer, the SYSGEN program prints #??# for all hardware automatic answers because it cannot perform hardware checks to ascertain the answers.

You must specify the distribution medium on which you received the RSTS/E kit. The automatic answer to the DISTRIBUTION MEDIUM question is #??#. Answer by typing the device name of the distribution medium (MM, MT, DK, DM, or DT). Remember that the device names MM and MT are not equivalent on the SYSGEN system. If the system generation files are on the current system disk (e.g., if you are generating RSTS/E on-line), type SY to specify the system disk.

The generated system can be output to the SYSGEN disk, another disk, magtape, or DECtape. DIGITAL recommends that the SYSGEN disk be the output medium only if that disk is a DM, DP, or DB type disk. If the output medium is an RK05 or smaller, the generated system should be output to a new disk or to a tape. Only the system initialization code, error message file, generated monitor SIL file, and generated run-time system file are written on an output disk to avoid cluttering the disk. An output DECtape receives the four system files above and the file CONFIG.MAC. An output magtape receives the four system files, all load maps, and the listing files. The automatic answer to the OUTPUT MEDIUM question is SY if the SYSGEN disk is large. Otherwise, the automatic answer is the same as the specified distribution medium.

NOTE

The SYSGEN system supports four RK05 drives and only two of each other disk type. If you plan to use a disk unit (not an RK05) other than 0 or 1 for the target system disk, you must use an intermediate medium (such as magtape) for output of the target system. You can later (as described in Chapter 5) copy the target system files to the final disk.

If you specify a disk as the output medium, the SYSGEN program prints the PACK ID question. Type the pack ID you specified when you initialized the output disk.

The system generation process places many files on the SYSGEN disk. If you need to conserve space on this disk, these files can be deleted after they are used. To delete the system generation files, answer YES to the DELETE FILES question. To retain the files, answer NO. On small disks (e.g., RF11), the system generation process will not complete unless you delete the files.

System generation creates load maps and (during RSTS/E monitor generation) assembly listing files. These files are unique for each system and contain valuable information for system documentation and maintenance. If a line printer is available during system generation, answer YES to the LP FOR SYSGEN question. The load maps will be printed automatically and you can request (in response to a later question) the printing of the assembly listings. If you answer NO to this question, none of the load maps or listings can be printed during system generation. If the answer to DELETE FILES is YES, but a line printer is not available, the load maps are not deleted from the SYSGEN disk.

The SYSGEN program allows you to generate an entire RSTS/E system, including monitor and BASIC-PLUS run-time system; only a monitor; or only the BASIC-PLUS run-time system. In addition, you can name both the RSTS/E monitor SIL and the BASIC-PLUS run-time system with any name you prefer. The name must be one to six alphanumeric characters. The default names for the RSTS/E monitor SIL and BASIC-PLUS run-time system are RSTS and BASIC, respectively. If you generate additional RSTS/E monitors or BASIC-PLUS run-time systems later, remember to assign different names to the new files.

4.2.2 System Clock

The RSTS/E system operates with one of two types of system clocks. The KW11-L Line Time Clock divides time into intervals based on the line frequency of the power source – either 50 Hz or 60 Hz. The designation Hertz (Hz) is the international term for cycles per second. The KW11-P Programmable Real Time Clock can also use the line frequency of the power source. However, the KW11-P has a crystal-controlled oscillator that can be used as the system time base independent of the power source frequency. The crystal operation KW11-P is beneficial in areas where the line frequency of the power source is not constant. The answer to the CLOCK? question establishes which type of clock RSTS/E uses and, for the KW11-P, which mode of operation (line frequency or crystal) RSTS/E uses. Note that if you configure a clock that does not exist on the system, RSTS/E automatically disables that clock and, at start-up time, automatically enables and uses the clock that exists.

The SYSGEN program requests the AC power frequency at which the computer will run. The PDP-11 computer requires alternating current (AC) power input. It can run on 60 Hz frequency, as is standard in the United States, or on 50 Hz frequency, as is standard in many other countries. Answer either 50 or 60, depending on the standard frequency of the power input at your installation.

The KW11-P 10 kHz crystal-controlled oscillator divides time to an interrupt rate given as interrupts per second. If you specify the crystal mode of operation, the SYSGEN program prints the KW11-P INTERRUPT RATE? question. The interrupt rate can be any multiple of 50 Hz from 50 Hz to 1000 Hz. DIGITAL recommends an interrupt rate of 100 Hz for all systems.

4.2.3 Terminal Devices and Software

A RSTS/E system can handle a maximum of 128 terminals. An installation can have any combination of local and remote line interfaces as long as the total number of terminal lines and pseudo keyboards does not exceed 128.

RSTS/E assigns to each terminal a keyboard number ranging from 0 to 127. The system assigns keyboard number 0 to the console terminal and refers to the console terminal by the device designator KB0:. The type of line interface that connects a terminal (other than the console terminal) to the system establishes its keyboard number. The keyboard number associated with each line is important because you must use it as a basis for specifying the terminal speeds allowed on each of the variable speed lines on the system. (See the description of the TTYSET.SPD file in Section 7.4.1 of the RSTS/E System Manager's Guide.)

RSTS/E assigns keyboard numbers in the following order: the system console terminal; all KL11, LC11, DL11A, and DL11B lines; DC11 (remote dial); DL11C and DL11D lines; DL11E (remote dial); PK (pseudo keyboards); DJ11 lines; and DH11 and DZ11 lines in increasing order of unit number and increasing order of configured lines within each unit.

4.2.3.1 Terminal Interfaces – The answers to the configuration questions concerning the number of each type of terminal interface must accurately reflect the hardware configuration. For example, DL11C and DL11D interfaces are similar in construction and operation to the DL11A and DL11B interfaces. However, the interfaces have different ranges of UNIBUS addresses. Because of this similarity, new installations often have problems with improper configuration of the terminal interfaces. You should rely on the automatic answers to verify the terminal interface configuration.

SYSGEN requests the number of lines to enable for each DJ11, DH11, and DZ11 multiplexer unit on the system. Each DJ11 or DH11 multiplexer unit includes 16 lines. Each DZ11 multiplexer unit includes 8 lines. You need not enable every line on a DJ11, DH11, or DZ11. Therefore, RSTS/E can be configured for fewer than the maximum number of lines physically present on each multiplexer unit. Enable fewer than the maximum number of lines for a multiplexer unit when you need to conserve memory or when enabling all the lines would exceed the limit of 128 lines. For example, if four DH11 and four DJ11 units are present, you can enable at most 127 of the 128 possible lines (because of the console terminal, which is always on a single-line interface). If N lines (where N is less than 16) are enabled on a DH11 or DJ11, the lines numbered N through 15 on the unit are not enabled. Lines not enabled are not available for use and are treated as nonexistent. Thus, if you enable five lines on a DZ11, lines 0 through 4 are operational and lines 5 through 7 on that DZ11 cannot be used unless the system is regenerated.

If possible enable all multiplexer lines during system generation so that you can later use currently unused lines without regenerating the system. The configuration questions do not ask you to specify which enabled multiplexer lines are actually to be used or which lines are to have modem control enabled (if modems are configured). The SET initialization option allows you to temporarily enable or disable any keyboard line and to enable or disable modem control.

DH11 and DZ11 multiplexers can support automatic answer data sets. A DM11-BB connects a DH11 to an automatic answer data set. If your system includes one or more DH11 multiplexers and DM11-BB modem control multiplexers, you can include support for automatic answer data sets on the DH11s. DZ11-A and DZ11-B unit include partial modem control, but DZ11-C and DZ11-D units do not. If your system includes DZ11-A or DZ11-B units, you can include support for automatic answer data sets on the DZ11s.

4.2.3.2 Pseudo Keyboards – You can configure as many as 127 pseudo keyboards into the system. Each copy of the BATCH program requires one pseudo keyboard to run user jobs. If you plan to run several copies of BATCH simultaneously, specify at least one pseudo keyboard for each copy of BATCH. One additional pseudo keyboard is necessary for each application that will use the pseudo keyboard features described in Section 4.5 of the RSTS/E Programming Manual.

NOTE

RSTS/E permits a maximum total of 128 single line interfaces, enabled multiplexer lines, and pseudo keyboards. (The console keyboard is always enabled.) If you configure more than 128 lines and pseudo keyboards, the SYSGEN program prints a message after the pseudo keyboard question and repeats all the terminal interface questions.

4.2.3.3 2741 Terminals – RSTS/E supports 2741 compatible terminals connected to DL11D, DL11E, and DC11 single line interfaces and to DH11 and DZ11 multiplexers. 2741 terminals normally use the RS232 EIA standard connection; hence, they can be connected locally to the computer through null modems to any of the preceding interfaces. They can also be connected through data sets or acoustic couplers for operation over telephone lines. You can include 2741 support on any combination of single line interfaces (DL11D, DL11E, and DC11) and multiplexers (DH11 and DZ11).

NOTE

To function properly on a RSTS/E system, a 2741-type terminal must have the Transmit Interrupt feature, the Receive Interrupt feature, and the ATTN (or BREAK) key. These features allow the terminal to recognize a reverse break signal from the computer, lock its keyboard, and enter receive mode. Most companies usually provide these as standard features but a few offer them as optional at extra cost.

RSTS/E supports four code and keyboard arrangements for 2741 terminals: IBM Correspondence Code (CORR), Extended Binary Coded Decimal (EBCD), Standard Binary Coded Decimal (SBCD), and Call 360 BASIC Code (C360). Section 23.8 of the RSTS/E System User's Guide describes the code and keyboard arrangements. You must define the code(s) your system should support so that the terminal service module can include them. You can specify any combination of the four supported codes.

If you configure more than one code, the terminal service includes a facility that enables a user at a 2741 terminal to change codes. The first code you name in response to the 2741 CODE(S)? question becomes the system default. For example, if your system will support both Correspondence and EBCD 2741 terminals, but you prefer EBCD as the default, type EBCD, CORR in response to the 2741 CODE(S)? question.

4.2.3.4 Multiple Terminal Service – The multiple terminal service option allows one BASIC-PLUS program to interact simultaneously with several terminals on one I/O channel. A BASIC-PLUS program can control several keyboards by establishing a master keyboard on a single channel and by assigning various other keyboards as slave terminals. To perform input or output, the program executes Record I/O statements on that single channel. It uses special software options to ascertain the keyboard being serviced. In addition, the system can automatically stall program execution in the absence of keyboard input. The system can then make the program eligible to run when keyboard input is pending from the master keyboard or from one of its slaves. Thus, a single program can interactively service low volume keyboard input and output associated with several stations. This facility eliminates the need to run separate copies of the same program at each terminal when several terminals must perform a similar function. Section 4.2 of the RSTS/E Programming Manual explains multiple terminal service in detail.

4.2.3.5 Echo Control – The echo control option allows a full duplex terminal to simulate block mode operation. A program can define fixed-length fields for user input and accept input from only one field at a time. Echo control also enables a program to define special characters for character deletion sequences within a field. Echo control is useful for data entry and other applications in which the programmer needs to control the appearance of terminal output. Refer to Section 4.3.3 of the RSTS/E Programming Manual for a complete description of the echo control facility.

4.2.4 Disk Devices

Disks in the RSTS/E system operate in either the public or private structure. The disk that contains the system accounts and executable code of RSTS/E is called the system disk and is the first disk of the public structure. All other disks in the system are referred to collectively as nonsystem disks.

A removable system disk is more practical on a RSTS/E system than a fixed system disk. If the system disk is an RK05 or RK06 disk cartridge or an RP02, RP03, RP04, RP05, or RP06 disk pack, you can remove it from the computer area when the system is not operating and keep it in a safe place to reduce the chances of inadvertent or malicious destruction. To preserve the contents of a fixed platter disk, you must copy the contents to a secondary medium each time you shut down the system.

If the system requires a large amount of public storage space, a single RP02, RP03, RP04, RP05, or RP06 disk pack drive is preferable to multiple RK05, RK05F, or RK06 DECpack disk drives. Each time a file is created within the public structure, the system searches the directories of each public disk to ensure that a file of the same name does not already exist. The use of multiple disks in the public structure increases the overhead required for such a search. You can use private disks rather than public disks as a method of reducing overhead on systems with multiple disk drives.

An RK05F moving head fixed disk is basically two RK05s with one set of read heads. It has twice the capacity of a single RK05, and provides increased capability at lower cost than multiple RK05s. Unit designations for each RK05F are an even-odd pair (e.g., 2 and 3, 4 and 5). You must initialize and format each half of the disk separately. An RK05F can be assigned unit designations of 0 and 1 and can be used as the system disk. However, DIGITAL recommends for security purposes that the system disk be a removable cartridge. Therefore, you can most effectively use an RK05F as a nonsystem disk.

You can obtain optimum performance if the system is configured with a removable, moving head disk and a fixed head disk. With such a configuration, the monitor can swap user jobs out of memory onto the faster fixed head disk. Disk accessing operations on the moving head system device can then be confined to manipulating user files and directories while the faster fixed head device takes on the burden of moving user jobs into and out of memory. In such a case, the fixed head disk need not contain valuable system data. At the start of time sharing operations, you can install swapping areas on the fixed head disk.

All moving head disk controllers allow several drives to perform seek operations simultaneously. Since the controller is not busy during seek operations, data transfers on one drive can overlap seeks in progress on other drives. If more than one drive is on the same controller, you can configure an overlapped seek driver to accelerate processing for the disks on that controller. The overlapped seek drivers, however, require more memory than the nonoverlapped seek drivers. The overlapped seek drivers provide advantages in throughput that normally outweigh the disadvantages of the additional memory required. Therefore, DIGITAL recommends the overlapped seek drivers for all systems with more than one disk drive on a single controller. The only exception to this recommendation is a system with a single RK05F disk and no RK05 disks. Because the RK05F disk has only one set of read heads for the even-odd unit pair, no overlapping can take place. You should configure the nonoverlapped seek driver for such a disk system.

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4.2.5 Peripheral Devices

The use of peripheral devices on the RSTS/E system reduces the burden of storage requirements on the disks and provides convenient media for file archives. You can store infrequently used program and data files on magnetic tape (DECtape or magtape), paper tape, and diskette. You can access the files readily when necessary. The paper tape reader and card reader provide convenient methods of input. You can improve the production of hard copy output on the RSTS/E system by using multiple line printers with different characteristics.

If the RSTS/E system has a card reader, configure one of the four following card codes: ANSI standard, DEC029, DEC026, or IBM 1401. Refer to Appendix D.3 of the RSTS/E System User's Guide for these card codes. The default card code is ANSI. The DEC029 code used by RSTS/E complies with the ANSI standard for punched card codes. IBM uses a card code that differs in three characters. If the DEC029 card code is configured on the system, a patch can be installed to change the decode table so that cards punched for use on IBM equipment can be read without misinterpretation. Refer to the RSTS/E Release Notes for information on the codes affected.

4.2.6 DECNET/E Network Considerations

DECNET/E is the DIGITAL network package for RSTS/E. DECNET/E allows user jobs to communicate with other DECNET systems in the network. The DECNET/E documentation describes in detail the concepts and capabilities of DECNET/E. Chapter 8 of the RSTS/E Programming Manual describes local communications. DECNET/E software is not included in the standard RSTS/E distribution kit but is licensed as a separate product. If your system includes DECNET/E, you must specify the medium on which you received the DECNET/E kit.

For network operation, the system must include at least one DMC11 interprocessor link. RSTS/E supports up to eight DMC11s.

Messages printed during the standard system generation tell you when to mount the medium containing the DECNET/E software.

4.2.7 RSTS/2780 Package

The 2780 package on RSTS/E allows users to communicate with other computers that have the 2780 Data Terminal package. The RSTS/2780 User's Guide describes the features of the 2780 package. The RSTS/2780 software is not included in the standard RSTS/E distribution kit, but is licensed as a separate product. Messages printed during system generation tell you when to mount the tape or disk containing the RSTS/2780 software. The 2780 package requires the KG11A communications arithmetic unit and a DP11, DU11, or DUP11 synchronous line interface unit.

4.2.8 System Capacity and Optional Features

4.2.8.1 Maximum Number of Jobs – With sufficient hardware, RSTS/E can handle up to 63 simultaneous jobs. You must specify a maximum number of jobs (the configured job maximum) at system generation time because this value determines the size of several monitor tables. You can set a lower maximum (the default job maximum) later when you set the system defaults. You cannot increase the configured job maximum without regenerating the RSTS/E monitor.

The maximum number of jobs that can be run efficiently depends on the memory space available and the number and types of disks on the system. Memory space requirements are described in Appendix D. To calculate the effect of disk devices, see Section 3.7.1.1, which describes swapping files.

4.2.8.2 Small Buffers – The RSTS/E system handles characters, data transfers, queued interjob messages, and file processing requests by using intermediate memory storage, called small buffers. Small buffers are 16-word storage units in the monitor part of memory. These buffers are a system resource. You must configure a sufficient number of them at system generation time. If you do not configure enough small buffers, jobs can become stalled because too few small buffers are available. Jobs must wait until enough buffers are freed by jobs currently claiming them.

The number of small buffers needed at any one time depends on the dynamic requirements of the jobs on the system. The automatic answer printed by the configuration question is computed as 9 for each configured job plus 80. This number is sufficient for most systems. Thus, for a typical 10-job system, you should configure 170 ((9 * 10) +80) small buffers.

For planning purposes, consider the following guidelines. Each active terminal requires four or five small buffers for normal input and output operations, and several more for echo control operations. Each job requires four small buffers for descriptive information about the job. Therefore, a system running 10 jobs and using 8 terminals needs 72 to 80 small buffers.

Next, consider the types of processing done on a typical system. Each file opened by a job requires one small buffer. If each of 10 jobs opens 2 disk files, RSTS/E needs 20 more small buffers. If all jobs open the maximum of 15 files simultaneously, 150 small buffers are necessary. On a typical system, the 2-file situation is more likely, so 20 more small buffers must be added for a running total of 92 to 100.

RSTS/E also uses small buffers for certain transient operations. The system uses one small buffer for each disk transfer queued by the monitor and one small buffer for each job that is installed as a message receiver. Many system programs, including QUEMAN, QUE, ERRCPY, BATCH, SPOOL, and OPSER, communicate through the send/receive system function calls. These system function calls claim one small buffer for each message queued for a receiving job. Normally, these operations use small buffers for short time periods (fractions of a second). A reasonable number of small buffers to allocate for such operations on the 10-job, 8-terminal system is approximately 35 small buffers, bringing the total to 127 to 135.

Unless the send/receive code can use extended buffer space (see Section 3.8.4.7), each pending message occupies small buffer space. The number of messages that the system can hold in the small buffer pool depends on the size of the messages and the speed with which the receiving job processes them. The following equation gives the number of small buffers (N) needed to process a message.

$$N = \frac{\text{length of message in bytes} + 8}{32} + 1$$

By substituting the correct value for the length of a message, performing the calculation, and rounding N up to the next integer, you can compute the number of small buffers needed to process any message. By using the equation, you can determine, for example, that a 512-byte message requires 18 small buffers. The size of the messages and the amount of message processing on the system affect the availability of small buffers. If the system processes many messages, you can improve system performance by allocating space to extended buffers.

Character-oriented output devices use small buffers to hold data awaiting output. These devices (line printer, terminal, and paper tape punch) have buffer quotas. A buffer quota is the number of small buffers a device should obtain for reasonable efficiency. The buffer quotas are 30 for a line printer, 10 for a terminal, and 6 for a paper tape punch. The sample system thus needs an extra 30 small buffers for one line printer. The running total is now 157 to 165 small buffers for an 8-terminal, 10-job system.

RSTS/E also uses small buffers for CCL commands and run-time systems. Each defined CCL command requires one small buffer. Auxiliary run-time systems (not the system default) that you add to the system with the UTILTY program also require one small buffer each. If the sample system has 10 CCL commands and 1 auxiliary run-time system, add another 11 small buffers to make the total 168 to 176.

The total requirement for an 8-terminal, 10-job system is approximately 170 small buffers, allowing for idle terminals and occasional system slowdown. Except for periods of heavy keyboard and message activity, enough free small buffers will be available to maintain good system throughput.

You can monitor system performance by observing the number of free small buffers available, as reported by the SYSTAT program. For good system performance, the number of free small buffers should never drop below ten.

4.2.8.3 System-Wide Logical Name Assignments – RSTS/E allows you to assign up to 30 logical names on a system-wide basis. Any user can type a system-wide logical name to access the device and account it represents. Each logical name assignment requires five words of monitor table space; therefore, you should not configure more logical assignments than your system will use. Refer to Section 7.2.2.1 of the RSTS/E Programming Manual for further information on system-wide logical names.

4.2.8.4 Power Fail Recovery Code – RSTS/E systems attempt to recover from a momentary power failure by performing an automatic restart procedure. A momentary power failure occurs whenever the AC power drops below 95 volts for 110 volt power (or 190 volts for 220 volt power) or outside a limit of 47 to 63 Hz (DC power). RSTS/E allows you to specify the delay factor (in seconds) before the system attempts to restart after a momentary power failure. The delay can be from 1 to 300 seconds (5 minutes). Specifying a relatively long delay factor ensures that all disk devices are ready before the system attempts to auto-restart. (For information on the recovery times required by various RSTS/E devices, consult the appropriate hardware publications.) Refer to Chapter 2 of the RSTS/E System Manager's Guide for further information on the RSTS/E auto-restart procedures.

4.2.8.5 File Processor Buffering – The optional file processor (FIP) buffering module accelerates file processing on the RSTS/E system. The module reduces the number of accesses to disk by maintaining more than one disk directory block in memory. FIP buffering is like cache memory operation in which faster access semi-conductor memory holds frequently used code or data to avoid accesses to the slower access main memory. The FIP buffering process improves the performance of system operations that involve accessing of disk directories because the related data are accessed in memory that is used as a cache. The following are representative operations that involve directory accesses:

- File OPEN and CLOSE operations
- Updating an in-memory window of a file
- Listing directories
- Wild card file operations
- Disk cleaning operations

Normally, FIP uses only one permanently allocated one-block buffer to store disk directory information. File processing is often delayed because at any given time the directory block that the file processor needs is not in its buffer.

The FIP buffering code claims free buffers from the normal small buffer pool and stores additional directory blocks in them. Frequently used information is thus kept in memory to avoid accesses to disk. If any of the buffers are required for their standard uses, the FIP buffering module releases them to the system. You need not increase the number of small buffers configured for other system operations when you include the FIP buffering module on the system.

You can enhance FIP buffering on the RSTS/E system by allocating additional memory for use by the FIP buffering module. The XBUF suboption of DEFAULT (Section 3.8.4.7) allows you to reserve a fixed amount of memory as extended buffer space. The FIP buffering module can use this space as a cache for disk directory blocks.

The module uses the available extended buffer space before it claims small buffers and does not use small buffers at all if you allocate more than 8K words of extended buffer space. By placing frequently accessed directory blocks in a special area of memory (the extended buffer pool), the FIP buffering module avoids disk accesses. This process prevents degradation of performance on a heavily loaded system, when fast access to directory blocks is needed and user jobs claim most of the small buffers.

With extended buffer space available, the FIP buffering module may increase the speed of an individual operation up to ten times or not at all (if the operation accesses none of the reserved memory). The module slightly degrades the performance of system operations that involve computing. Increased overhead in the monitor causes this degradation, which can be as low as a fraction of 1% or as high as 12%. Generally, the central processor degradation increases in direct proportion to the improvement in directory related operations.

RSTS/E allows you to control the FIP buffering facility with the ENABLE CACHE and DISABLE CACHE commands in the UTILTY program. (Refer to Chapter 7 of the RSTS/E System Manager's Guide for further information on the UTILTY program.) Therefore, you can disable the module if system use will be heavily compute-bound. You can later re-enable the module when speed of directory operations is needed. In general, however, the FIP buffering module greatly improves system performance and its use is strongly recommended.

4.2.8.6 Resident Code – You can configure certain portions of the overlay code to be resident in memory rather than to be stored on disk during time sharing. System performance improves if frequently used code is made resident. The size of each potentially resident segment of code is listed in Appendix D.

The most important code in terms of system performance is the disk-handling code. This code includes the following: 1) the system routines for disk file creation; 2) OPEN and CLOSE routines; 3) routines for processing the RUN command; 4) general routines for opening other devices, deassigning devices, fetching error messages, and looking up files by name; and 5) routines needed for logout. Because disk handling code is so frequently used, DIGITAL recommends that you configure it as resident if at all possible.

The send/receive code provides interjob communications for such programs as OPSER, QUEMAN, BATCH, and RJ2780. If your system applications require frequent interjob communication, resident send/receive code improves system performance.

The simple SYS call code is used whenever a program executes a SYS call to the file processor (SYS code 6). These SYS calls are often used in DIGITAL-supplied system library programs. If your system has more than 64K words of memory and frequently uses file processor SYS calls, you should make the SYS call dispatch code resident.

The file delete and rename code deletes and renames RSTS/E files. If your system is quite large or your applications require an inordinate number of file delete and rename operations, you may prefer to make the code resident.

The login, attach, and attribute code logs in and attaches jobs and performs file attribute read/write operations for systems that use the optional FCS/RMS-11 software. If your system is large or runs many programs that use FCS/RMS-11 files, you may prefer to make this code resident.

The directory listing code gathers information about disk directories, performs wildcard disk file lookups, and manipulates file identification blocks for certain files. This code is small, but it is less important than most of the other potentially resident code.

4.2.9 BASIC-PLUS Run-time System Considerations

Several optional features are available for the BASIC-PLUS run-time system. These features include mathematical functions, the Print Using facility, matrix manipulation, and string arithmetic.

4.2.9.1 Floating Point Precision and Scaled Arithmetic – You can select either single-precision (2-word) or double-precision (4-word) floating point format as the type of numeric format to be used on the system. These floating point formats are described in Appendix E.1 of the BASIC-PLUS Language Manual.

Your answers to the FPP, FIS, MATH PRECISION, and FUNCTIONS questions establish which mathematical software package the SYSGEN program selects from the ten standard packages included in the RSTS/E distribution kit. Table 4-3 describes the 2-word math packages.

Table 4-3
Two-Word Math Packages

Math Package	Description
MA2, XL2, XT2	Without FIS or FPP; with extended functions
MA2	Without FIS or FPP; without extended functions
MA2I, XL2I, XT2I	11/40 compatible FIS; with extended functions
MA2I	11/40 compatible FIS; without extended functions
MA2F, XL2F, XT2F	11/45 compatible FPP; with extended functions
MA2F	11/45 compatible FPP; without extended functions

Table 4-4 describes the 4-word math packages.

Table 4-4
Four-Word Math Packages

Math Package	Description
MA4, XL4, XT4	Without FIS or FPP; with extended functions
MA4	Without FIS or FPP; without extended functions
MA4F, XL4F, XT4F	11/45 compatible FPP; with extended functions
MA4F	11/45 compatible FPP; without extended functions

The most critical difference among packages is the implementation of floating point operations. The PDP-11/45 compatible Floating Point Processor (FPP) provides both 2-word and 4-word floating instructions in hardware. The PDP-11/40 compatible Floating Instruction Set (FIS) does not provide 4-word floating point instructions in hardware. Therefore, on PDP-11/40 computers with or without FIS, RSTS/E must use the slower software packages (XL4, XT4 or MA4) to perform 4-word floating point operations.

On PDP-11 computers without FPP hardware, the size of a BASIC-PLUS run-time system that includes the 4-word floating point software may exceed the maximum of 16K words. To avoid exceeding the limit, you must omit some optional features when you configure BASIC-PLUS. The minimum size of the BASIC-PLUS run-time system with a 4-word floating point format and without FPP hardware is 14110 words. Table 4-5 lists the sizes of the optional BASIC-PLUS features. Choose features from Table 4-5 so that the total size of the BASIC-PLUS run-time system is at most 16383 words.

Table 4-5
Sizes of BASIC-PLUS Options

Option	Size (decimal words)
Math Functions:	
Trigonometric functions (SIN, COS, TAN, ATN)	323
Logarithmic functions (LOG, LOG10, EXP, SQR)	392
Polynomial calculation	43
Total	758
Print Using	724
Matrices	752
String Arithmetic	874

Some installations may need only one part of the math functions (e.g., the logarithmic functions) and may prefer to delete the other part (i.e., the trigonometric functions) in favor of another option. If so you can perform an editing procedure (which is described in the RSTS/E Release Notes) to delete the logarithmic or trigonometric portion of the math functions. (The polynomial calculation portion of the math functions is present if either the trigonometric or logarithmic functions are included.) Perform the procedure immediately after finishing the configuration questions, and before running SYSBAT.

The scaled arithmetic feature is standard only on systems with 4-word floating point format. Scaled arithmetic is described in Section 6.8 of the BASIC-PLUS Language Manual and the SCALE command is described in Section 8.10 of the RSTS/E System User's Guide. Scaled arithmetic helps users to avoid problems such as loss of precision normally associated with floating point calculations. The feature is useful for calculating sums that cannot be manipulated easily as integer quantities.

4.2.9.2 Mathematical Functions – You can reduce the size of the BASIC-PLUS language code by omitting the mathematical functions SIN, COS, TAN, ATN, SQR, EXP, LOG, and LOG10. These functions are described in Section 3.7 of the BASIC-PLUS Language Manual and summarized in Table 3-1 of that section.

4.2.9.3 Time and Date Formats – BASIC-PLUS reports the time in either 24-hour or AM/PM format, as in 21:13 and 9:13 PM, respectively. It normally reports the date (in the DATE$( ) function) as a string in DD-MMM-YY format, with an alphabetic month (for example, 04-Jul-76). It can, however, report the date as a numeric string in YY.MM.DD format. In this format, July 4, 1976 appears as 76.07.04. An all-numeric format is useful for applications that must sort data according to date. Note that all programs that use the BASIC-PLUS DATE$( ) function report the date in the format you specify. Most system programs that use a date as input, however, require the DD-MMM-YY format.

4.2.9.4 Print Using Option – The PRINT USING optional feature allows BASIC-PLUS programs to perform special formatting of output as described in Section 10.3.3 of the BASIC-PLUS Language Manual. You can reduce the size of BASIC-PLUS by omitting this option.

4.2.9.5 Matrix Manipulation – BASIC-PLUS can operate on an entire matrix using single statements called MAT statements as described in Chapter 7 of the BASIC-PLUS Language Manual. You must configure this optional feature if you want to include the matrix manipulation (MAT statement) capability.

4.2.9.6 String Arithmetic – BASIC-PLUS can, at your option, include the special string arithmetic functions SUM$, DIF$, PROD$, QUO$, PLACE$, and COMP%. These functions perform arithmetic operations on strings of numerics, minus signs and decimal points, with an accuracy of up to 56 digits. The string arithmetic functions, although slow to execute, are useful for applications such as monetary conversions, which can involve numbers that require a high degree of precision. Refer to Section 5.6 of the BASIC-PLUS Language Manual for complete information on the string arithmetic functions.

4.3 RUNNING THE SYSBAT PROGRAM

After you answer the final configuration question, the SYSGEN program completes the building of the configuration file (CONFIG.MAC) and the batch control file (SYSGEN.CTL). The program then prints a message instructing you to edit the files (if desired) and start the batch process. If editing is necessary, use the program EDIT.SAV, which is on the distribution tape or disk.

Type R SYSBAT in response to the dot (.) prompt character to start the batch process. The batch process executes commands in the batch control file to generate the RSTS/E monitor Save Image Library (SIL) and the BASIC-PLUS run-time system. Normally, logins have been enabled by CREATE.SAV. If CREATE.SAV has not been run since the system was last started, the batch process fails to log in and aborts. You should run the UTILTY program and issue the LOGINS command before restarting the batch process.

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The batch process performs input and output to a pseudo keyboard, and prints all pseudo keyboard input and output at the console terminal, two spaces indented. As it executes, the batch process may request that you mount the distribution medium, ready a line printer (if you requested assembly listings), and mount the output medium for the target system. The following is an example of a batch process request.

```
MOUNT DEC-11-ORSPA-E-WC9 ON A MAGTAPE DRIVE

WITH NO "WRITE RING" AND SET TO "ON LINE"

Mount MM:"ORSPAE"-write locked
Unit ? 0
```

In response to the UNIT? question, type the unit number on which you have mounted the tape.

The batch stream begins by attempting to delete the assembly listing files and other system generation files from previous system generations. If you have never generated a system on the current disk or if you have already deleted the listing files, the batch process cannot find the files. If so, the following appears in the console print-out:

```
.R PIP.SAV
*TBL.OBJ,TTDVR.OBJ/D
?Can't find file or account - file TBL    .OBJ - continuins
?Can't find file or account - file TTDVR  .OBJ - continuins
*TBL.LST,TTDVR.LST/D
?Can't find file or account - file TBL    .LST - continuins
?Can't find file or account - file TTDVR  .LST - continuins
*RSTS.SAV,EMT.SAV,FIP.SAV,OVR.SAV,NSP.SAV,RJ2780.SAV/D
?Can't find file or account - file RSTS   .SAV - continuins
?Can't find file or account - file EMT    .SAV - continuins
?Can't find file or account - file FIP    .SAV - continuins
?Can't find file or account - file OVR    .SAV - continuins
?Can't find file or account - file NSP    .SAV - continuins
?Can't find file or account - file RJ2780.SAV - continuins
*RSTS.MAP,EMT.MAP,FIP.MAP,OVR.MAP,NSP.MAP,RJ2780.MAP/D
?Can't find file or account - file RSTS   .MAP - continuins
?Can't find file or account - file EMT    .MAP - continuins
?Can't find file or account - file FIP    .MAP - continuins
?Can't find file or account - file OVR    .MAP - continuins
?Can't find file or account - file NSP    .MAP - continuins
?Can't find file or account - file RJ2780.MAP - continuins
*RSTS.STB,EMT.STB,FIP.STB,OVR.STB,NSP.STB,RJ2780.STB/D
?Can't find file or account - file RSTS   .STB - continuins
?Can't find file or account - file EMT    .STB - continuins
?Can't find file or account - file FIP    .STB - continuins
?Can't find file or account - file OVR    .STB - continuins
?Can't find file or account - file NSP    .STB - continuins
?Can't find file or account - file RJ2780.STB - continuins
*^C
```

The error message does not mean that an error has occurred in the system generation procedure. It simply indicates that the files from a previous system generation cannot be found and, therefore, cannot be deleted. The following errors may appear for the same reason when SYSBAT starts linking the BASIC-PLUS run-time system.

```
.R PIP.SAV
*BASIC.SAV,BASIC.STB/D
?Can't find file or account - file BASIC .SAV - continuing
?Can't find file or account - file BASIC .STB - continuing
*^C
```

If any other error messages appear in the batch print-out, the system generation process may be in error. Refer to Appendix B.3 for a description of batch process error messages.

When the execution of the batch stream is complete, SYSBAT prints an informative message and returns to the dot (.) prompt character.

4.4 SHUTTING DOWN THE SYSGEN SYSTEM

When the batch process completes execution and returns to the dot (.) prompt character, shut down the SYSGEN system.

To shut down the SYSGEN system, run the UTILTY program and issue the NO LOGINS and SHUTUP commands. (If you mounted any disks that the batch process did not logically dismount, issue the DISMOUNT command before issuing the SHUTUP command). The following example illustrates the procedure.

```
.R UTILTY
*NO LOGINS
*SHUTUP
```

The UTILTY program disables logins and shuts down the SYSGEN system. The shutdown procedure automatically loads into memory and bootstraps the RSTS/E system initialization code from the SYSGEN disk. Remove the distribution medium and store it in a safe place. After the system initialization code prints its identifying message and the OPTION: prompt, you can proceed to Chapter 5 to tailor the target RSTS/E system.

4.5 SUMMARY OF PROCEDURES

This section summarizes the procedures you must follow to 1) run the CREATE.SAV program, 2) answer the configuration questions, 3) run the SYSBAT.SAV program, and 4) shut down the SYSGEN system. Figure 4-1 illustrates the flow of the procedures.

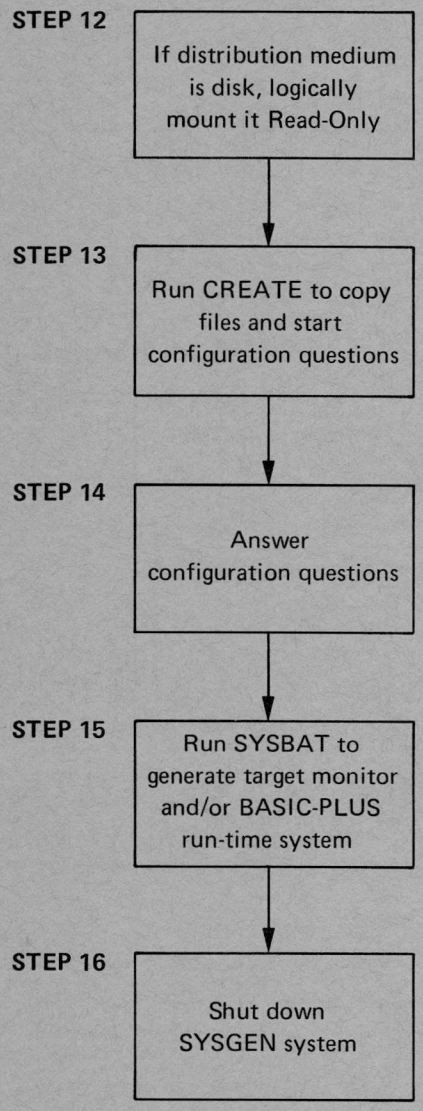
STEP 12
If distribution medium is disk, logically mount it Read-Only
STEP 13
Run CREATE to copy files and start configuration questions
STEP 14
Answer configuration questions
STEP 15
Run SYSBAT to generate target monitor and/or BASIC-PLUS run-time system
STEP 16
Shut down SYSGEN system

Figure 4-1 Summary of Batch and Configuration Procedures

STEP 12. Mounting the Distribution Disk

Procedure:

If your distribution medium is RK05 or RK06 disk cartridge, mount it on a free unit and ensure that it is write-locked. Type the following command to logically mount the disk:

.MOUNT dev:ORSPAE/RO

Replace dev: in the command with the device name and unit number on which the distribution disk cartridge is physically mounted.

STEP 13. Running the CREATE.SAV Program

Procedure:

Run the CREATE.SAV program, which includes a batch stream that transfers the SYSGEN program and several other programs to the system disk. Type the following command:

```
.R dev:CREATE.SAV
```

Substitute the name of the distribution medium (MM, MT, DT, DK, or DM) and the unit number on which it is mounted for dev. If the distribution medium is DECtape, specify the unit on which you mounted the tape labelled DEC-11-ORSBA-E-UC2.

STEP 14. Answering the Configuration Questions

Procedure:

The SYSGEN program automatically answers the configuration questions by printing a response in one of the three forms in Table 4-6.

Table 4-6
Automatic Answer Formats

Answer	Reason
RES	The program has ascertained that RES is the correct answer.
#RES#	The program assumes that RES is the correct answer.
#??#	The program does not know and cannot guess the correct answer.

Answer the configuration questions, referring to Sections 4.2 through 4.2.9.6 if necessary. Table 4-7 lists the possible responses to the configuration questions. Table 4-8 summarizes the short form questions.

Table 4-7
Possible Responses to Configuration Questions

Response	Meaning
<string>	<string> is the correct answer.
RETURN key	Print the long, explanatory form of the question.
LINE FEED key	Accept the automatic answer for the question. Not valid if the automatic answer is #??#.
ESC key	Return to the preceding question or to the first question in this sequence.

Table 4-8
Summary of Short Form Configuration Questions

Question	Possible Responses	Comments
FORM?	S, L	Answer S for short form or L for long form.
SAME SYSTEM?	Y, N	Answer Y if you are generating a system for the current machine.
DISTRIBUTION MEDIUM?	MT, MM, DK, DM, DT, SY	Specify the distribution medium type. If you are regenerating on-line, specify SY to use system generation files already on the system disk.
OUTPUT MEDIUM?	DF, DK, DM, DP, DB, MT, MM, DT, SY	The SYSGEN system supports four RK05 drives and only two of each other disk type. If you plan to use a disk unit (not an RK05) other than 0 or 1 for the target system disk, you must use an intermediate medium (such as magtape) for output of the target system. You can later (in steps 17 and 18) copy the target system files to the final disk.
PACK ID?	Pack ID specified when output disk was initialized	
DELETE FILES?	Y, N	Answer Y to delete SYSGEN system files from the SYSGEN disk after use.
LP FOR SYSGEN?	Y, N	If the answer to this question is N and the answer to DELETE FILES? is Y, the maps are not deleted.
GENERATE MONITOR?	Y, N	If N, the next question is BASIC-PLUS RTS NAME?
MONITOR NAME?	1 to 6 alphanumeric characters	The RSTS/E monitor SIL file has the extension .SIL. Do not type the name of a SIL that is already on the target disk.
ASSEMBLY LISTINGS?	Y, N	Asked only if the answer to LP FOR SYSGEN? is Y. The automatic answer is Y if the answer to DELETE FILES? is Y.
GENERATE BASIC-PLUS	Y, N	If you answer N, the next question is CLOCK?
BASIC-PLUS RTS NAME?	1 to 6 alphanumeric characters	BASIC-PLUS run-time system file has the extension .RTS. Do not type the name of a run-time system that is already on the target disk.
CLOCK?	L, P, C	If SYSGEN finds both the KW11-L and KW11-P clocks, its automatic answer is C.
AC FREQ?	50, 60	
KW11P INTERRUPT RATE?	50, 100, 150...1000	Asked only if the answer to CLOCK? is C.
KL11, LC11, DL11A, DL11B'S?	1 to 16	Include the console terminal in your count.
DL11C, DL11D'S?	0 to 31	
DC11'S?	0 to 32	

Table 4-8 (Cont.)
Summary of Short Form Configuration Questions

Question	Possible Responses	Comments
DL11E'S?	0 to 31	After this question, SYSGEN returns to the KL11, LC11, DL11A, DL11B'S? question if you have configured more than 31 DL11C, DL11D, and DL11E interfaces.
DJ11'S?	0 to 16	If you answer 0, the next question is DH11'S?
DJ11 UNIT xx LINES ENABLED?	0 to 16	SYSGEN repeats this question for each DJ11 unit configured.
DH11'S?	0 to 16	If you answer 0, the next question is DZ11'S?
DH11 UNIT xx LINES ENABLED?	0 to 16	SYSGEN repeats this question for each DH11 unit configured.
DATASET SUPPORT FOR DH11'S?	Y, N	
DZ11'S?	0 to 16	If you answer 0, the next question is PSEUDO KEYBOARDS?
DZ11 UNIT xx LINES ENABLED?	0 to 8	SYSGEN repeats this question for each DZ11 unit configured.
DATASET SUPPORT FOR DZ11'S?	Y, N	
PSEUDO KEYBOARDS?	0 to 127	If you have configured more than 128 terminals (including the console terminal and pseudo keyboards), SYSGEN returns to the KL11, LC11, DL11A, DL11B'S? question.
2741 SUPPORT?	Y, N	Asked only if you configured one or more DL11D, DL11E, DC11, DH11, or DZ11 interfaces. If you answer N, SYSGEN goes to the MULTI-TERMINAL SERVICE? question.
SINGLE LINE 2741 SUPPORT?	Y, N	Asked only if you configured DL11D, DL11E, or DC11 interfaces.
2741 SUPPORT ON DH'S?	Y, N	Asked only if you configured one or more DH11's.
2741 SUPPORT ON DZ'S?	Y, N	Asked only if you configured one or more DZ11's.
2741 CODE(S)?	CORR, EBCD, SBCD, C360	Any combination of the four codes is legal.
MULTI-TERMINAL SERVICE?	Y, N	
ECHO CONTROL?	Y, N	
RC11/RS64'S?	Y, N	
RF/RS11'S?	Y, N	
RS03/RS04'S?	0 to 8	

Table 4-8 (Cont.)
Summary of Short Form Configuration Questions

Question	Possible Responses	Comments
RK05'S?	0 to 8	If the controller exists, the automatic answer is 8. If the answer is 0 or 1, SYSGEN skips the next question. Remember to count RK05F disks as two RK05 units.
OVERLAPPED SEEK?	Y, N	
RK06'S?	0 to 8	If the controller exists, the automatic answer is 8. If the answer is 0 or 1, SYSGEN skips the next question.
OVERLAPPED SEEK?	Y, N	
RP02/RP03'S?	0 to 8	If the controller exists, the automatic answer is 8. If the answer is 0 or 1, SYSGEN skips the next question.
OVERLAPPED SEEK?	Y, N	
RP04/RP05/RP06'S?	0 to 8	If you answer 0 or 1, SYSGEN skips the next question.
OVERLAPPED SEEK?	Y, N	
TU16'S?	0 to 8	If the controller exists, the automatic answer is 8.
TU10'S?	0 to 8	If the controller exists, the automatic answer is 8.
DECTAPES?	0 to 8	If the controller exists, the automatic answer is 8.
PRINTERS?	0 to 8	
RX01'S?	0 to 8	If the controller exists, the automatic answer is 8.
CR11/CM11 CARD READER?	Y, N	
CD11 CARD READER?	Y, N	
CARD DECODE?	029, 026, 1401, ANSI	SYSGEN skips this question if you answered N to the two previous prompts.
P.T. READER?	Y, N	
P.T. PUNCH?	Y, N	
DECNET NETWORK SUPPORT?	Y, N	If you answer N, SYSGEN skips the next two questions.
DMC11'S?	1 to 8	
DECNET/E DISTRIBUTION MEDIUM?	MT, MM, DK, DM, DT, SY	
2780 SUPPORT?	Y, N	If you answer N, SYSGEN skips the next two questions.
2780 INTERFACE?	DP, DU	If both are on the system, the automatic answer is DU.
2780 DISTRIBUTION MEDIUM?	MT, MM, DK, DM, DT, SY	
MAXIMUM JOBS?	1 to 63	
SMALL BUFFERS?	30 to 999	The automatic answer is 9 times the configured job maximum plus 80, but no more than 500.
SYSTEM WIDE LOGICALS?	0 to 30	

Table 4-8 (Cont.)
Summary of Short Form Configuration Questions

Question	Possible Responses	Comments
DELAY FACTOR?	1 to 300	
FIP BUFFERING?	Y, N	
RESIDENT DISK HANDLING?	Y, N	
RESIDENT SEND/ RECEIVE?	Y, N	
RESIDENT SIMPLE SYS CALLS?	Y, N	
RESIDENT FILE DELETE/RENAME?	Y, N	
RESIDENT LOGIN/ ATTACH/ATTRIBUTE?	Y, N	
RESIDENT CATALOG/ LOOKUP?	Y, N	
FPP?	Y, N	The remaining questions are asked only when you are generating BASIC-PLUS. If you answer Y, SYSGEN skips the next question.
FIS?	Y, N	
MATH PRECISION?	2, 4	
FUNCTIONS?	Y, N	
TIME FORMAT?	AM, 24	
ALPHABETIC MONTH?	Y, N	
PRINT USING?	Y, N	
MATRICES?	Y, N	
STRING ARITHMETIC?	Y, N	

STEP 15. Running the SYSBAT Program

Procedure:

a. Type the following command to start the execution of the batch process:

```
.R SYSBAT
```

b. When the batch process asks you to mount a disk or tape, or to enable a line printer, do so. Answer its UNIT? query by typing the unit number on which you mounted the disk or tape or the unit number of the line printer you enabled. If the SYSGEN system is running, only line printer unit 0 is legal.

STEP 16. Shutting Down the SYSGEN System

Procedure:

Run the UTILTY program and issue the NO LOGINS and SHUTUP commands, as follows:

```
.R UTILTY
*NO LOGINS
*SHUTUP
```

The shutdown procedure automatically loads and bootstraps the system initialization code from the current system device. Remove the distribution medium and store it in a safe place.

CHAPTER 5
TAILORING THE TARGET SYSTEM

After generating the target system, use the initialization code to tailor the target system to your installation. You need to 1) bootstrap the target disk, 2) install the target monitor, 3) correct the system code, 4) manipulate the system files, 5) establish default start up conditions for the target system, 6) specify device unit characteristics, and 7) start the target system.

5.1 BOOTSTRAPPING THE TARGET DISK

Before you can install the target monitor, the initialization code must be running and the system device must be the target disk. If the SYSBAT batch process wrote the target system on the SYSGEN system disk, the system shut down procedure has already loaded the initialization code from the target disk. Proceed to Section 5.2 to install the target monitor.

If the batch stream wrote the target system on another disk or on tape, bootstrap that disk or tape. Next, if the target system is on tape, copy the target system files to the target disk. The copying operation automatically bootstraps the target disk. After the target disk is bootstrapped, you can set hardware characteristics (if necessary).

5.1.1 Bootstrapping the Disk or Tape

Use the BOOT option (described in Section 3.11) to bootstrap the disk or tape output from the SYSBAT batch process. Type BOOT or BO in response to the OPTION: prompt. When the BOOT DEVICE: prompt appears, type the device name and unit number of the disk or tape to be bootstrapped. The initialization code bootstraps the device and returns to the OPTION: prompt. If the target system is on disk, proceed to Section 5.1.3 to set hardware characteristics. If the target system is on tape, follow the procedures in Section 5.1.2 to transfer the target system files from tape to disk.

5.1.2 Copying Files from Tape to Disk

If you have not already initialized the target disk, use the DSKINT option to do so. Type DSKINT or DS to invoke the DSKINT option, and then use the option to initialize the disk as a system disk. Refer to Section 3.2 for a complete description of the DSKINT option.

After initializing the target disk, use the COPY option (described in Section 3.3.) to copy the system initialization code, the RSTS/E monitor SIL, the run-time system file, and the default error message file from tape to the target system disk. The COPY option automatically bootstraps the target system disk.

You can now set hardware characteristics for the target system disk.

5.1.3 Specifying Hardware Characteristics

If you have not previously used the target disk as a system disk (or if the target disk is a fixed head disk), you may need to set console terminal fill characteristics and correct the hardware configuration.

If your console terminal has a fill characteristic other than 0, use the FILL option (Section 3.1.4). The FILL option allows you to set fill characteristics for a variety of terminal types.

The DIGITAL field service engineer who installed your system may have informed you of changes that are necessary for your system's hardware configuration. Use the HARDWR option (Section 3.5) to make any necessary changes.

5.2 INSTALLING THE TARGET MONITOR

Use the INSTALL option (described in Section 3.6) to install the target RSTS/E monitor. To invoke the INSTALL option, type INSTALL or IN in response to the initialization code's OPTION: prompt. When the option prints the SIL? query, type the name you specified for the RSTS/E monitor SIL during the configuration questions. The INSTALL option checks the monitor SIL for format, sets bits in the monitor SIL to install it, then returns to the OPTION: prompt. Execution of the INSTALL option takes about 30 seconds.

5.3 CORRECTING THE SYSTEM CODE

Immediately after installing the monitor, use the PATCH option to correct the system code. Consult the RSTS/E Release Notes and other software publications for patches that your system requires. Follow the instructions in the published patch. If you need more information on the PATCH option, refer to Section 3.4.

5.4 ALLOCATING SYSTEM FILES

The REFRESH option (Section 3.7) creates, deletes, and positions files on any disk. If the target system is on the SYSGEN disk, you should use REFRESH to ensure that the system file allocation is correct. If the target system is not on the SYSGEN disk, you may need to use REFRESH to create all the system files.

5.5 SETTING DEFAULT START UP CONDITIONS

The DEFAULT option (Section 3.8) establishes system defaults for job and swap maximums, the run-time system, the error message file, the installation name, memory allocation, crash dumps, and magtape labels. Use the DEFAULT option to set these defaults for the newly generated monitor.

5.6 SPECIFYING CHARACTERISTICS FOR UNITS OF DEVICES

The SET option (described in Section 3.9) establishes device characteristics on a unit-by-unit basis. If your system includes one or more line printers, use SET to declare type, width, and case for each unit. You can also enable and disable units of a device, enable and disable modem control for keyboards, and restrict the use of devices by unprivileged jobs.

5.7 STARTING THE TARGET SYSTEM

After you specify characteristics for units of devices, use the START option (Section 3.10) to start the target system. You can invoke the START option by typing START (or ST) or by pressing the LINE FEED key. If you type START or ST, the START option prints questions that allow you to change certain default start up conditions. After you answer the questions, the START option prints a list of all the disabled devices on the system. If you press LINE FEED to start timesharing, the START option prompts you for only the current date and time and prints only a line telling the number of disabled devices on the system. If you omit the questions (i.e. press LINE FEED), you cannot change any of the default start up conditions.

5.8 SUMMARY OF PROCEDURES

This section summarizes the procedures you must follow to start timesharing with the target system after the batch stream writes the target monitor to disk or tape. Figure 5-1 illustrates the flow of the procedures.

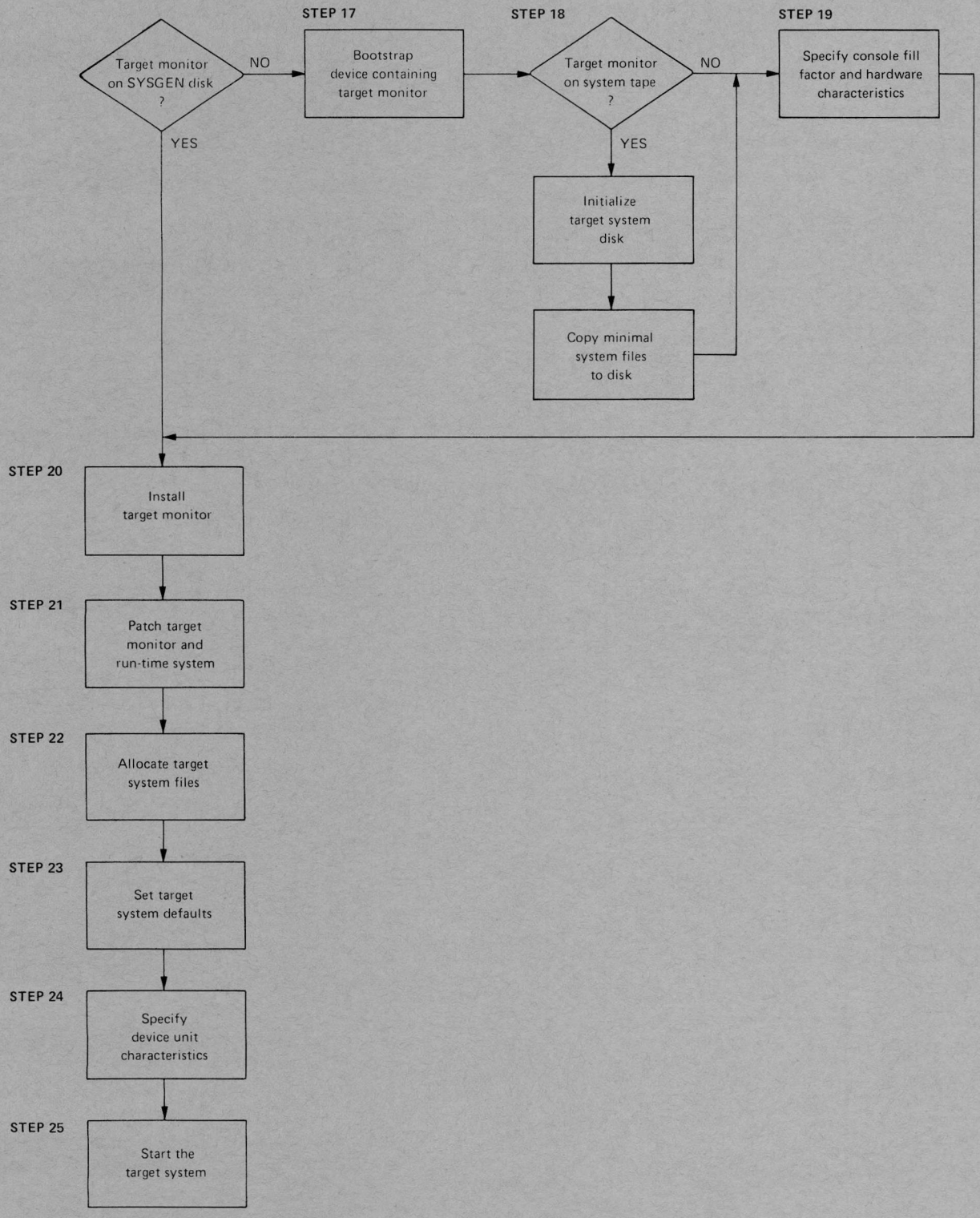

Figure 5-1 Summary of Start-up Procedures for the Target System

STEP 17. Bootstrapping the Device that Contains the Target System Monitor

Follow this procedure only if the batch stream wrote the target system monitor on a device other than the SYSGEN system disk.

Procedure:

Use the BOOT initialization option to bootstrap the initialization code from the device containing the target system monitor. Respond to the BOOT option prompt as follows:

```
BOOT DEVICE: xxn
```

Substitute the name of the device that contains the target monitor for xx and the unit number on which it is mounted for n.

STEP 18. Preparing the Target System Disk

Follow this procedure only if the batch stream wrote the target system monitor on a system tape or if the target system disk will be on unit 2-7 of a disk other than RK05.

Procedure:

a. If you have not already initialized the target system disk, use the DSKINT option now to do so. Summary Table 5-1 contains the DSKINT questions and possible responses. Refer to Section 3.2 for further information on DSKINT.

b. Use the COPY option to copy the target system files from the system tape to the target system disk. Summary Table 5-2 contains the COPY option questions and possible responses.

Table 5-1
Summary of DSKINT Option

Question	Possible Responses
DD-MMM-YY?	Current date. Press LINE FEED to accept the date printed.
HH:MM?	Current time. Press LINE FEED to accept the time printed.
DISK?	DC, DF, DS, DK, DM, DP, or DB
UNIT?	0-7 (asked for multi-unit controllers only)
PLATTERS(n)?	1-8 for DF disks 1-4 for DC disks Press LINE FEED to use the number in parentheses. (asked for DC and DF disks only)
PACK ID?	One to six alphanumeric characters
PACK CLUSTER SIZE?	1, 2, 4, 8, or 16 for RS11, RS64, RS03, RS04, RK05, RK05F, and RK06 disks 2, 4, 8, or 16 for RP02 and RP03 disks 4, 8, or 16 for RP04 and RP05 disks 8 or 16 for RP06 disks
SATT.SYS BASE?	A number from 1 to (disk size − 1). Press the LINE FEED key to let DSKINT place SATT.SYS at the first available space.
MFD PASSWORD?	One to six alphanumeric characters
MFD CLUSTER SIZE?	A power of two not less than the pack cluster size and not greater than 16
PUB, PRI, OR SYS?	PUB for a public disk PRI for a private disk SYS for a system disk
CREATE LIBRARY ACCOUNT?	Y or N (N skips the next two questions.)
LIBRARY PASSWORD?	One to six alphanumeric characters
LIBRARY UFD CLUSTER SIZE?	A power of two not less than the pack cluster size and not greater than 16. The library UFD cluster size must be at least 4.
DATE LAST MODIFIED?	Y or N
FORMAT?	Y or N
PATTERNS?	1-8. Append X to specify up to eight of your own patterns in addition to the standard patterns.
YOUR PATTERN?	An octal word from 1 to 177777. Press LINE FEED to indicate no more patterns. (Asked only if you appended X to the previous response.)
PROCEED (Y OR N)?	Y or N

Table 5-2
Summary of COPY Option

Question	Possible Responses
DD-MMM-YY?	Current date or LINE FEED to accept the date printed.
HH:MM?	Current time or LINE FEED to accept the time printed.
TO WHICH DISK?	DC, DF, DS, DK, DM, DP, or DB
UNIT?	0-7 (asked for multi-unit controllers only)

STEP 19. Specifying Hardware Characteristics for the Target System Disk

Follow the procedures in this step only if the batch stream wrote the target system monitor on a device other than the SYSGEN system disk.

Procedure:

a. If necessary, use the FILL option to set the console terminal fill characteristics. Summary Table 5-3 contains the possible fill characteristics. Refer to Section 3.14 for further information on the FILL option.

b. If the DIGITAL field service engineer who installed your system informed you of any necessary hardware controller changes, use the HARDWR option to make those changes. Summary Table 5-4 contains the HARDWR option questions and possible responses. Refer to Section 3.5 for further information on the HARDWR option.

Table 5-3
Recommended Console Terminal Fill Characteristics

Fill Characteristic	Terminal
0	ASR33, KSR33, VT05, LA30, VT50, VT52, LA36
1	ASR35, KSR35
3	VT05B
LA30S	LA30S

Table 5-4
Summary of HARDWR Option

Question	Possible Responses
HARDWR SUBOPTION?	LIST DISABLE ENABLE CSR VECTOR DM RESET EXIT CTRL/C You can abbreviate the names to their first 2 characters. (applies changes and returns to OPTION:) (applies no changes and returns to OPTION:)
LIST Suboption:	
The LIST Suboption does not ask questions.	
DISABLE Suboption:	
CONTROLLER TO DISABLE?	Controller name. Type ? for a list of controller names.
ENABLE Suboption:	
CONTROLLER TO ENABLE?	Controller name. Type ? for a list of controller names.
CSR Suboption:	
CONTROLLER WITH NON-STANDARD ADDRESS?	Controller name. Type ? for a list of controller names.
NEW CONTROLLER ADDRESS?	Type an even octal address greater than 160000. Type RE to remove a nonstandard address. Type CTRL/Z to return to HARDWR SUBOPTION? without specifying a new address.
VECTOR Suboption:	
CONTROLLER WITH NON-STANDARD VECTOR?	Controller name. Type ? for a list of controller names.
NEW VECTOR ADDRESS?	Type an even octal address from 0 to 776. Type RE to remove a nonstandard vector. Type CTRL/Z to return to HARDWR SUBOPTION? without specifying a new vector.
DM Suboption:	
DH for DMn(xxx)?	Type the DH11 unit number. Press LINE FEED to accept the current setting of xxx. Type CTRL/Z to return to the HARDWR SUBOPTION? question.
RESET Suboption:	
RESET does not ask questions.	

STEP 20. Installing the Target Monitor

Procedure:

Use the INSTALL option to install the target monitor. In response to the SIL? question, type the name you specified in response to the MONITOR NAME? configuration question. Refer to Section 3.6 for further information on the INSTALL option.

STEP 21. Patching the Monitor and Run-Time System Code

Procedure:

Use the PATCH option to apply any necessary patches to the target system monitor and the run-time system that will be the default. Follow the patching procedures in the RSTS/E Release Notes or Software Dispatch to apply the patches. Refer to Section 3.4 for further information on the PATCH option.

STEP 22. Allocating Target System Files

Procedure:

Use the REFRESH option to ensure that system files are correctly allocated. If the SYSGEN and target disks are the same, you may need only to list the file status table to be sure of the allocation. If the batch process wrote the target system on another device, you must allocate and position all files now. Summary Table 5-5 contains the REFRESH option questions and responses. Refer to Section 3.7 for further information on the REFRESH option.

Table 5-5
Summary of REFRESH Option

Question	Possible Responses
DD-MMM-YY?	Current date. Press the LINE FEED key to accept the date printed.
HH:MM?	Current time. Press the LINE FEED key to accept the time printed.
DISK?	DC, DF, DS, DK, DM, DP, or DB. Press the LINE FEED key to REFRESH the system disk.
UNIT?	0-3 for DC disks 0-7 for all other disks
CLEAN?	Y to clean the disk. N or LINE FEED to omit the cleaning operation.
REFRESH SUBOPTION?	LIST, CHANGE, FILE, or BADS. Type EXIT or press the LINE FEED key to return to the OPTION: prompt.
LIST Suboption:	
The LIST suboption does not ask questions.	
CHANGE Suboption:	
filnam.ext CHANGES?	Y or N. Type CTRL/Z to return to the REFRESH SUBOPTION? query. Asked for the following files, in order: SWAP.SYS, SWAP0.SYS, SWAP1.SYS, SWAP3.SYS, OVR.SYS, ERR.SYS, BUFF.SYS, and CRASH.SYS. If you answer Y to filnam.ext CHANGES? for any file, the CHANGE suboption asks the DELETE?, SIZE?, and BASE? questions for that file. After you have answered the filnam.ext CHANGES? question for each of the listed files, the suboption asks the OTHER FILES? question.
DELETE?	Y or N. (Asked only if the file exists.) Type CTRL/Z to return to filnam.ext CHANGES? for the current file.

Table 5-5 (Cont.)
Summary of REFRESH Option

Question	Possible Responses
SIZE?	A decimal number of blocks. Type CTRL/Z to return to filnam.ext CHANGES? for the current file.
BASE?	The decimal number of the logical block at which you prefer to start the file. Type OLD or the LINE FEED key to retain the file at its current starting location. Type 0 to place the file at the first available space. Type CTRL/Z to return to the filnam.ext CHANGES? question for the current file.
OTHER FILES?	Type a filename and extension to change another file in account [0,1]. The suboption then asks the DELETE?, SIZE?, and BASE? questions. Type N or LINE FEED to omit changes to other files.
FILE Suboption:	
FILE NAME?	Filename and extension
FILE EXISTS. DELETE IT?	Y or N. Type CTRL/Z to return to the FILE NAME? question.
SIZE?	A decimal number of blocks. Type CTRL/Z to return to the FILE NAME? question.
BASE?	The decimal number of the logical block at which you prefer to start the file. Type OLD or the LINE FEED key to retain the file at its current starting location. Type 0 to place the file at the first available space. Type CTRL/Z to return to the FILE NAME? question.
DELETABLE?	Y or N. Press the LINE FEED key for no change. Type CTRL/Z to return to the FILE NAME? question.
BADS Suboption:	
BADS?	Type LIST for a list of bad blocks in the bad block file. Type ADD to add bad blocks to the bad block file. Type EXIT or the LINE FEED key to return to the REFRESH SUBOPTION? query.
BLOCK NUMBER?	(Asked only if you answered ADD to the BADS? query.) Type a logical block number (in decimal) between 1 and the disk size minus 1.
REALLY ADD LOGICAL BLOCK nn TO BADB.SYS?	Y or N

STEP 23. Setting Defaults for the Target System

Procedure:

Use the DEFAULT option to set defaults for the new monitor. Summary Table 5-6 contains DEFAULT option questions and responses. Refer to Section 3.8 for further information on the DEFAULT option.

Table 5-6
Summary of DEFAULT Option

Question	Possible Responses
JOB MAX OR SWAP MAX CHANGES?	Y or N.
NEW JOB MAX?	Decimal number from 1 to configured job maximum.
NEW SWAP MAX?	8 to 28.
RUN-TIME SYSTEM?	Name of the run-time system that you prefer as the system default.
ERROR MESSAGE FILE?	Name of the error message file that you prefer as the system default.
INSTALLATION NAME?	1-14 printable characters including spaces.
ANY MEMORY ALLOCATION CHANGES?	Y or N.
TABLE SUBOPTION?	LIST, PARITY, RESET, LOCK, UNLOCK, RTS, XBUF. Type EXIT or the LINE FEED key to proceed to the CRASH DUMP? question.
LIST, PARITY, and RESET Table Suboptions: These suboptions do not ask any questions.	
LOCK Table Suboption:	
LOCK ADDRESS IS?	Address or range of addresses.[1]
UNLOCK Table Suboption:	
UNLOCK ADDRESS IS?	Address or range of addresses.[1]
RTS Table Suboption:	
NEW RUN TIME SYSTEM ADDRESS IS?	Starting address.[1]
XBUF Table Suboption:	
EXTENDED BUFFER SPACE ADDRESS RANGE IS?	Address or range of addresses.[1]
CRASH DUMP?	Y or N.
MAGTAPE LABELLING DEFAULT?	If the distribution medium is magtape, type DOS. If the distribution medium is DECtape or disk, type DOS or ANSI.

[1]An address typed in response to any of the following questions can be expressed either as an absolute octal address or as a decimal integer followed by the letter K. To name a range of addresses, type two addresses in the specified format, separated by a hyphen. Legal addresses are, for example, 00577777, 21K, 00130000-00137777, and 18K-23K.

STEP 24. Specifying Characteristics for Units of Devices

Procedure:

Use the SET option to set modem control for keyboards, enable and disable device units, establish line printer characteristics, and set device assignment privileges. Summary Table 5-7 contains SET option questions and possible responses. Refer to Section 3.9 for further information on the SET option.

Table 5-7
Summary of SET Option

Question	Possible Responses
SET SUBOPTION?	LIST, MODEM, LOCAL, LP, DISABLE, ENABLE, PRIV, UNPRIV. Type EXIT or the LINE FEED key to return to the OPTION: prompt.
LIST Suboption:	
DEVICE?	Type a device name; device name and unit number; device name and two unit numbers for a range of devices (for example, KB1-6); or press the LINE FEED key to list all devices.
MODEM and LOCAL Suboptions:	
KB?	Type a decimal number between 0 and the highest numbered keyboard or a range of decimal keyboard numbers.
LP Suboption:	
UNIT?	Decimal unit number. Not asked if only one is present.
TYPE (xx)?	LP, LV, LS. Press LINE FEED to accept the setting in parentheses. Press RETURN to print the characteristics associated with LP, LV, and LS.
WIDTH (n)?	Type a decimal number between 1 and 254 or press the LINE FEED key to accept the setting in parentheses. Common widths are 80 and 132 columns.
LOWER CASE (x)?	Y or N. Press LINE FEED to accept the setting in parentheses.
ENABLE and DISABLE suboptions:	
DEVICE?	Type a device name or a device name followed by unit number. For ENABLE suboption only, type ALL to enable all devices.

Table 5-7 (Cont.)
Summary of SET Option

Question	Possible Responses
UNIT?	Type a unit number in decimal or two unit numbers separated by a hyphen. Type ALL to enable or disable all units of a device. This question is not asked if you specify a unit number in response to the previous question.
PRIV and UNPRIV Suboptions:	
DEVICE?	Type a device name or device name followed by unit number. For the UNPRIV suboption only, type ALL to free access to all devices.
UNIT?	Type a unit number in decimal or two unit numbers separated by a hyphen. Type ALL to restrict or free access to all units of the device.

STEP 25. Starting the Target System

Procedure:

Use the START option to start timesharing. The START option asks several of the DEFAULT option questions. When you answer these questions, you can override the defaults for the current timesharing session. These questions are summarized with the DEFAULT questions in Table 5-6. Refer to Section 3.10 for further information on the START option.

CHAPTER 6

BUILDING SYSTEM LIBRARY FILES

After you start the target system your next step in system generation is to build the system library files and create user accounts. The DSKINT initialization option creates the system library account [1, 2] on the system disk. Use the BUILD program to create the system library files. Create tailored text and message files with the PIP or EDIT program and create user accounts with REACT.

When timesharing operations start, the monitor sets up job 1 under account [1, 2] and attempts to run the INIT system program. Since no programs initially exist in account [1, 2], the monitor generates the ?CAN'T FIND FILE OR ACCOUNT error and prints the READY message. The console terminal (KB0:) is at BASIC-PLUS command level and job 1 is active, as if a user had logged into the system.

With the console terminal at command level, you can run BUILD from the medium on which the RSTS/E system library files are stored. Once started, the BUILD program runs detached, reads commands from a control file, and executes those commands at the console terminal. Upon completion, the BUILD program reattaches job 1 to the console keyboard.

Table 6-1
Control Files for the BUILD Program

File	Function
BUILD.CTL	Builds a standard system library usable on all systems.
SPLER.CTL	Builds files executable only on a system with a SWAP MAX value of 16K words.

Run the BUILD program once for each set of files required on the system. Section 6.1 describes the files created by each control file. Section 6.2 describes the procedures you must follow to run BUILD from the three types of distribution media. The system programs built by these procedures are described in Part IV of the RSTS/E System User's Guide and in the RSTS/E System Manager's Guide. You can remove from the RSTS/E System User's Guide the descriptions of programs that will not be run on the system.

After building the appropriate files you can install any optional software (COBOL, FORTRAN IV, RJ2780, etc.) that your system will support. When you have installed the optional software, create several ASCII text and message files as described in Section 6.4. Finally, create the user accounts on the system disk. These procedures are described in Section 6.5.

6.1 CONTROL FILES FOR THE BUILD PROGRAM

The BUILD program uses two control files, BUILD.CTL and SPLER.CTL. The BUILD.CTL file contains commands that create a standard system library. The SPLER.CTL file contains commands that create programs requiring a job area of 16K words. The following sections describe the system library files that the BUILD program creates.

6.1.1 BUILD.CTL File

Commands in the BUILD.CTL file create a standard system library for all systems. Table 6-2 lists these programs and files. Section 6.4 supplies procedures for changing the sample ASCII text and message files. References provided in Table 6-2 are section numbers in either the *RSTS/E System User's Guide* (SUG) or the *RSTS/E System Manager's Guide* (SMG).

Table 6-2
BUILD.CTL Programs and Files

Program or File Name	Protection	Description	Section Reference*
LOGIN.BAC	<232>	Logs users into system	SUG – 14.1
LOGOUT.BAC	<232>	Logs users off system	SUG – 14.2
BUILD.BAC	<124>	Builds system library files	Chapter 6, Section 7.4
UTILTY package	<124>	System utility package	SMG – 7.1
INIT.BAC	<124>	Initializes system at start of timesharing	SMG – 3.1
SYSCAT.BAC	<124>	Creates a directory listing of accounts on a file structured device	SMG – 4.3
PRIOR.BAC	<124>	Changes priority, run burst, and SWAP MAX value	SMG – 3.3
TALK.BAC	<232>	Provides inter-terminal communications	SMG – 7.8.1
ANALYS package	<124>	Analyzes system crash information and retrieves error data	SMG – 6.2
SYSTAT.BAC	<232>	Reports system status	SMG – 7.2 SUG – 15.1
UMOUNT.BAC	<232>	Mounts and dismounts private disks	SUG – 20.2
QUOLST.BAC	<232>	Lists disk quota and usage data for current user	SUG – 15.2
ERRINT.BAC	<124>	Validates or initializes ERRLOG.FIL for the ERRCPY program; chains to ERRCPY	SMG – 6.1
ERRCPY.BAC	<124>	Copies hardware error data to a disk file	SMG – 6.1
ERRDIS package	<124>	Formats error data	SMG – 6.1
SHUTUP.BAC	<124>	Performs standard and OPSER system shut down	SMG – 3.2
PIP.BAC	<104>	Transfers files from one peripheral device to another (small version)	SUG – 17.1

*The abbreviation SUG refers to the *RSTS/E System User's Guide* and SMG refers to the *RSTS/E System Manager's Guide.*

Table 6-2 (Cont.)
BUILD.CTL Programs and Files

Program or File Name	Protection	Description	Section Reference*
FILCOM.BAC	<104>	Compares ASCII files	SUG – 16.3
MONEY.BAC	<104>	Performs system accounting functions	SUG – 15.3 SMG – 4.2
GRIPE.BAC	<232>	Records user comments	SUG – 15.2 SMG – 7.7
REACT.BAC	<124>	Creates user accounts	SMG – 4.1
TTYSET.BAC	<232>	Sets terminal characteristics	SUG – 20.1 SMG – 7.4
PLEASE.BAC	<232>	Prints requests at console terminal and interacts with OPSER package	SMG – 5.6
INUSE.BAC	<232>	Prints terminal "INUSE" warning message	SUG – 15.3
START.CTL	<60>	Sample system start up control file	SMG – 3.1.7
CRASH.CTL	<60>	Sample system crash recovery control file	SMG – 3.1.8
TTY.CMD	<60>	Sample indirect command file for setting terminal characteristics	SMG – 3.1.3
SPOOL.CMD	<60>	Sample indirect command file for spooling and operator services packages	SMG – 3.1.4
RTS.CMD	<60>	Sample indirect command file for adding auxiliary run-time systems	SMG – 3.1.5
CCL.CMD	<60>	Sample indirect command file for defining CCL commands	SMG – 3.1.6
ANALYS.CMD	<60>	Sample indirect command file for crash analysis	SMG – 3.1.8
ERRDAT.FIL	<60>	Error logging data file	SMG – 6.1
ACCT.SYS	<60>	Sample system accounts file	SMG – 4.1.3
TTYSET.SPD	<60>	Sample terminal speed control file	SMG – 7.4.1
PIP.TXT	<40>	PIP program help message text file (small version)	SUG – 17.1.2
ERRDIS.HLP	<60>	Error display program help file	SMG – 6.1
HELP.TXT	<40>	Sample system help message text file	SUG – 2.1.4

*The abbreviation SUG refers to the *RSTS/E System User's Guide* and SMG refers to the *RSTS/E System Manager's Guide.*

Table 6-2 (Cont.)
BUILD.CTL Programs and Files

Program or File Name	Protection	Description	Section Reference*
NOTICE.TXT	<40>	Sample system notices text file	SUG – 14.1.1
DIRECT.HLP	<40>	DIRECT program help message file	SUG – 16.1
EDIT package	<104>	DOS compatible text editor	RSTS/E Text Editor Manual
ODT.BAC	<124>	Octal debugging tool	SMG – 6.3
DSKINT.BAC	<124>	Initializes formatted disks	SMG – 7.5
DIRECT.BAC	<232>	Lists disk directories	SUG – 16.1
COPY.BAC	<104>	Copies entire tapes and disk cartridges	SUG – 17.3
REORDR.BAC	<124>	Restructures user file directories for optimal access	SMG – 7.6
UTILTY.TXT	<60>	UTILTY program help message file	SMG – 7.1.1
COPY.TXT	<40>	COPY program help message file	SUG – 17.3

*The abbreviation SUG refers to the *RSTS/E System User's Guide* and SMG refers to the *RSTS/E System Manager's Guide.*

6.1.2 SPLER.CTL Files

Commands in the SPLER.CTL file create programs that require a job area larger than 8K words. Table 6-3 describes these programs. References in Table 6-3 are section numbers in either the RSTS/E System User's Guide (SUG) or the RSTS/E System Manager's Guide (SMG).

To build these files, you must have set the system SWAP MAX value large enough when you used the DEFAULT initialization option. If the current swap maximum is too small when BUILD creates a given program, the system generates the ?MAXIMUM MEMORY EXCEEDED error. After the BUILD program terminates, all of the SPLER.CTL files exist in the system library. Those programs that generated the ?MAXIMUM MEMORY EXCEEDED error cannot run on the system. You should delete them to prevent further errors. If the system does not require the queue management and batch facilities, delete the programs QUE, QUEMAN, QUMRUN, SPOOL, SPLIDL, SPLRUN, PLEASE, OPSER, OPSRUN, BATCH, BATIDL, BATDEC, BATRUN, BATDCD, and CHARS from the library.

Table 6-3
SPLER.CTL Programs and Files

Program or File Name	Protection	Description	Section Reference*
OPSER package	<124>	Operator services package	SMG – 5.2
CHARS.BAC	<124>	Creates the character generation file	SMG – C.1
QUE.BAC	<232>	Creates requests for spooling programs	SUG – Chap. 21

*The abbreviation SUG refers to the *RSTS/E System User's Guide* and SMG refers to the *RSTS/E System Manager's Guide.*

Table 6-3 (Cont.)
SPLER.CTL Programs and Files

Program or File Name	Protection	Description	Section Reference*
QUEMAN.BAC	<124>	Queue manager	SMG – 5.3
SPOOL package	<124>	Line printer spooling package	SMG – 5.4
BATCH package	<124>	Batch control spooling package	SUG – Chap. 22 SMG – 5.5
RUNOFF.BAC	<232>	Document formatting program	RUNOFF USER'S GUIDE
VT5DPY.BAC	<232>	Displays system status on VT05. Created from DISPLY.BAS and VT05.DPY	SMG – 7.3
RUNOFF.RNO	<40>	Sample RUNOFF text file	See RUNOFF. DOC
BATDCD.BAC	<124>	Creates BATCH program command decoding file BATCH.DCD	SMG – C.2
PIP.BAC	<104>	Extended Peripheral Interchange Program	SUB – 17.2
VT50PY.BAC	<232>	Status display program for VT50 and VT52. Created from DISPLAY.BAS and VT50.DPY	SMG – 7.3
FLINT.BAC	<104>	Copies files between diskettes and RSTS/E disks	SUG – Chap. 19
PIP.TXT	<40>	Extended PIP help message file	SUG – 17.2
BACKUP.HLP	<40>	BACKUP package help message file	
BACKUP package	<232>	System Backup package	SMG – Chap. 8 SUG – Chap. 18
BACDSK.BAC	<232>	Writes BACKUP file structure on disks	SMG – 8.3.5

* The abbreviation SUG refers to the *RSTS/E System User's Guide* and SMG refers to the *RSTS/E System Manager's Guide.*

6.2 BUILDING THE SYSTEM LIBRARY FROM DISTRIBUTION MEDIA

The following three sections describe the building of the system library files from magtape, disk cartridge and DECtape distribution media.

6.2.1 Building the System Library from Magtape

DIGITAL supplies the system library files on two magtapes. The first tape contains the standard system library files and the second tape contains the large programs.

To build the system library from magtape, follow the procedures in the next two sections.

6.2.1.1 Building the Standard System Library BUILD.CTL – You should execute the BUILD.CTL file for all systems.

Perform the following steps:

1. Ensure that the write enable ring is removed from the reel labelled:

   DEC-11-ORS1A-E-MA7, SYSTEM LIBRARY TAPE PART 1 (for a 7 track TU10 drive)
   DEC-11-ORS1A-E-MA9, SYSTEM LIBRARY TAPE PART 1 (for a 9-track TU10/TS03 or TU16/TU45 drive)

2. Mount this tape on unit 0. Ensure that no other drive is selected to 0.
3. Ensure that the FILE PROT indicator is on.
4. Position the tape at its load point. (The LD PT indicator comes on.)
5. Set the ON-LINE/OFF-LINE switch to its ON-LINE position. Ensure that the READY indicator comes on.

Type the following command to execute the BUILD program:

```
RUN MT0:$BUILD
```

BUILD runs and prints the following questions:

```
SYSTEM BUILD? YES
TARGET SYSTEM DEVICE <SY0:>? LF
SOURCE INPUT DEVICE? MT0:
LIBRARY OUTPUT DEVICE <SY:>? LF
LIBRARY ACCOUNT <[1,2]>? LF
```

Type YES in response to the SYSTEM BUILD question and press LINE FEED in response to the TARGET SYSTEM DEVICE question to accept the default. Specify MT0: as the source input device. In response to the LIBRARY OUTPUT DEVICE question, specify the device on which the system library should be written. If you accept the default of SY:, the system library is written to the mounted disks in the public structure. Normally, only the system disk is mounted during the system library build procedure and therefore, it receives the complete system library. An RF11 disk, however, cannot hold RSTS/E and its system library. Therefore, if the system device is an RF11 disk, mount an additional public disk on which to write the system library. To logically mount the disk, type a command of the following format:

```
MOUNT dev:packid
```

Replace dev with the device name and unit number of the disk and replace packid with its pack identification label. In response to the LIBRARY ACCOUNT question, press LINE FEED to accept the default of [1, 2].

The BUILD program now begins executing commands in the BUILD.CTL file.

NOTE

If any errors occur in reading the magtape, retry the procedure on another drive. If no other drive is available, either have Field Service align the heads on the drive or obtain a new magtape.

The following is an example of the console printout of the entire procedure.

```
RUN MT0:$BUILD
BUILD   V06B-03 RSTS V06B-02 *TIME SHARING*
SYSTEM BUILD? YES
TARGET SYSTEM DEVICE <SY0:>? (LF)
SOURCE INPUT DEVICE? MT0:
LIBRARY OUTPUT DEVICE <SY:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
ASSIGN [1,2]
OLD MT0:$LOGIN
COMPILE SY0:@LOGIN
CHAIN 'MT0:$BUILD' 9200

Ready


Ready


Ready


Ready

^C
HELLO

RSTS V06B-02 *TIME SHARING*  Job 2  KB0  11-Nov-76  11:02 PM
# 1 / 2
Password:
Job 1 is detached under this account
Job number to attach to?
1 other user is logged in under this account


Ready

ASSIGN [1,2]

Ready


!********** BUILD.CTL - STANDARD LIBRARY PROGRAMS

OLD MT0:$LOGOUT

Ready

COMPILE SY0:@LOGOUT

Ready
```

DIGITGRAPH
P. O. Box 4249
Tucson, Arizona 85717

```
OLD MTO:$UTILTY

Ready

COMPILE SYO:@UTILTY

Ready

OLD MTO:$UTILT1

Ready

COMPILE SYO:@UTILT1

Ready

OLD MTO:$INIT

Ready

COMPILE SYO:@INIT

Ready

OLD MTO:$SHUTUP

Ready

COMPILE SYO:@SHUTUP

Ready

OLD MTO:$ERRINT

Ready

COMPILE SYO:@ERRINT

Ready

OLD MTO:$ERRCPY

Ready

COMPILE SYO:@ERRCPY

Ready

OLD MTO:$PIP

Ready
```

```
COMPILE SY0:@PIP<40>

Ready

OLD MT0:$DIRECT

Ready

COMPILE SY0:@DIRECT

Ready

OLD MT0:$TTYSET

Ready

COMPILE SY0:@TTYSET

Ready

OLD MT0:$SYSTAT

Ready

COMPILE SY0:@SYSTAT

Ready

OLD MT0:$EDIT

Ready

COMPILE SY0:@EDIT<40>

Ready

OLD MT0:$EDITCH

Ready

COMPILE SY0:@EDITCH<40>

Ready

OLD MT0:$BUILD

Ready

COMPILE SY0:@BUILD

Ready
```

```
OLD MTO:$ERRDIS

Ready

COMPILE SY :@ERRDIS

Ready

OLD MTO:$ERRDET

Ready

COMPILE SY :@ERRDET

Ready

OLD MTO:$ANALYS

Ready

COMPILE SY :@ANALYS

Ready

OLD MTO:$ANALY1

Ready

COMPILE SY :@ANALY1

Ready

OLD MTO:$SYSCAT

Ready

COMPILE SY :@SYSCAT

Ready

OLD MTO:$PRIOR

Ready

COMPILE SY :@PRIOR

Ready

OLD MTO:$ODT

Ready
```

```
COMPILE SY :@ODT
Ready
OLD MTO:$REACT
Ready
COMPILE SY :@REACT
Ready
OLD MTO:$REORDR
Ready
COMPILE SY :@REORDR
Ready
OLD MTO:$DSKINT
Ready
COMPILE SY :@DSKINT
Ready
OLD MTO:$UMOUNT
Ready
COMPILE SY :@UMOUNT
Ready
OLD MTO:$COPY
Ready
COMPILE SY :@COPY<40>
Ready
OLD MTO:$FILCOM
Ready
COMPILE SY :@FILCOM<40>
Ready
```

```
OLD MTO:$QUOLST

Ready

COMPILE SY :@QUOLST

Ready

OLD MTO:$MONEY

Ready

COMPILE SY :@MONEY<40>

Ready

OLD MTO:$GRIPE

Ready

COMPILE SY :@GRIPE

Ready

OLD MTO:$TALK

Ready

COMPILE SY :@TALK

Ready

OLD MTO:$PLEASE

Ready

COMPILE SY :@PLEASE

Ready

OLD MTO:$INUSE

Ready

COMPILE SY :@INUSE

Ready

RUN SYO:@PIP
PIP      V06B-03   - RSTS V06B-02 *TIME SHARING*
#SYO:@NOTICE.TXT<40>=MTO:$NOTICE.TXT/FA
#SYO:@HELP   .TXT<40>=MTO:$HELP   .TXT/FA
#SYO:@START .CTL     =MTO:$START .CTL/FA
```

```
#SY0:@TTY    .CMD     =MT0:$TTY    .CMD/FA
#SY0:@SPOOL  .CMD     =MT0:$SPOOL  .CMD/FA
#SY0:@RTS    .CMD     =MT0:$RTS    .CMD/FA
#SY0:@CCL    .CMD     =MT0:$CCL    .CMD/FA
#SY0:@CRASH  .CTL     =MT0:$CRASH  .CTL/FA
#SY0:@ANALYS.CMD      =MT0:$ANALYS.CMD/FA
#SY0:@UTILTY.TXT      =MT0:$UTILTY.TXT/FA
#SY0:@ERRDAT.FIL      =MT0:$ERRDAT.FIL/CO
#SY0:@PIP    .TXT<40>=MT0:$PIP    .TXT/FA
#SY0:@DIRECT.HLP<40>=MT0:$DIRECT.HLP/FA
#SY0:@TTYSET.SPD      =MT0:$TTYSET.SPD/FA
#SY :@ERRDIS.HLP      =MT0:$ERRDIS.HLP/FA
#SY :@ACCT   .SYS     =MT0:$ACCT   .SYS/FA
#SY :@COPY   .TXT<40>=MT0:$COPY   .TXT/FA
#=SY0:@LOGIN .BAC<232>/RE
#=SY0:@LOGOUT.BAC<232>/RE
#=SY0:@DIRECT.BAC<232>/RE
#=SY0:@TTYSET.BAC<232>/RE
#=SY0:@SYSTAT.BAC<232>/RE
#=SY :@UMOUNT.BAC<232>/RE
#=SY :@QUOLST.BAC<232>/RE
#=SY :@GRIPE .BAC<232>/RE
#=SY :@TALK  .BAC<232>/RE
#=SY :@PLEASE.BAC<232>/RE
#=SY :@INUSE .BAC<232>/RE
#^C


Ready

RUN SY0:@UTILTY
UTILTY  V06B-03 RSTS V06B-02 *TIME SHARING*
#LOGINS
#EXIT

Ready

^C

Ready

HELLO

RSTS V06B-02 *TIME SHARING*  Job 2  [1,2]  KB0  11-Nov-76  11:15 PM
Job 1 is detached under this account
Job number to attach to?  1
Attaching to Job 1

BUILD COMPLETE

Ready
```

The tape rewinds several times at the beginning of the procedure but does not rewind after the statement OLD MT0:LOGOUT$. Multiple copies of some programs are on the tape to reduce the number of rewinds required.

The messages BUILD COMPLETE and READY signal the end of execution. When these messages appear, dismount the distribution tape and store it in a safe place. If you do not plan to include files from the SPLER.CTL file set on the system, you need not build any more files. Proceed to Section 6.3. If your system requires spooling programs and files, proceed to Section 6.2.1.2 to build them.

6.2.1.2 Building the Large Programs SPLER.CTL – Building the programs from the SPLER.CTL file requires a user job area larger than 8K words as described in Section 6.1.2. DIGITAL supplies the large programs on a separate magtape from the standard system library files. To build the large programs perform the following procedures.

1. Ensure that the write enable ring is removed from the reel labelled:

   DEC-11-ORS2A-E-MA7, SYSTEM LIBRARY TAPE PART 2 (for a 7-track drive)
   DEC-11-ORS2A-E-MA9, SYSTEM LIBRARY TAPE PART 2 (for a 9-track TU10/TS03 or TU16/TU45 drive)

2. Mount this tape on unit 0. Ensure that no other drive is selected to unit 0.
3. Ensure that the FILE PROT indicator is on.
4. Position the tape at its load point. (The LD PT indicator comes on.)
5. Set the ON-LINE/OFF-LINE switch to its ON-LINE position. Ensure that the READY indicator comes on.

Type the following command:

```
RUN $BUILD
```

The program prints the following questions:

```
SYSTEM BUILD? NO
SOURCE INPUT DEVICE? MT0:
LIBRARY OUTPUT DEVICE <SY:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
CONTROL FILE IS? $SPLER.CTL
```

Type NO in response to the SYSTEM BUILD question. Type MT0: as the source input device and press LINE FEED to use the public disk structure as the library output device. In response to the LIBRARY ACCOUNT question, press LINE FEED to accept the default of [1, 2]. Finally, type $SPLER.CTL to specify the correct control file.

The following example is the complete console printout of the entire procedure.

```
RUN $BUILD
BUILD   V06B-03 RSTS V06B-02 *TIME SHARING*
SYSTEM BUILD? NO
SOURCE INPUT DEVICE? MT0:
LIBRARY OUTPUT DEVICE <SY:>? LF
LIBRARY ACCOUNT <[1,2]>? LF
CONTROL FILE IS? $SPLER.CTL
^C
HELLO

RSTS V06B-02 *TIME SHARING*  Job 2  KB0  11-Nov-76  11:17 PM
# 1 / 2
Password:
Job 1 is detached under this account
Job number to attach to?
1 other user is logged in under this account



Ready

ASSIGN [1,2]

Ready


!********** SPLER.CTL - LARGE PROGRAM BUILD

OLD MT0:$PIPEXT

Ready

COMPILE SY :@PIP<40>

Ready

OLD MT0:$DISPLY

Ready

APPEND MT0:$VT05  .DPY

Ready

COMPILE SY :@VT5DPY

Ready

OLD MT0:$DISPLY

Ready
```

```
APPEND MTO:$VT50  .DPY

Ready

COMPILE SY :@VT50PY

Ready

OLD MTO:$RUNOFF

Ready

COMPILE SY :@RUNOFF<40>

Ready

OLD MTO:$FLINT

Ready

COMPILE SY :@FLINT<40>

Ready

OLD MTO:$QUE

Ready

COMPILE SY :@QUE

Ready

OLD MTO:$QUEMAN

Ready

COMPILE SY :@QUEMAN

Ready

OLD MTO:$QUMRUN

Ready

COMPILE SY :@QUMRUN

Ready

OLD MTO:$OPSER

Ready
```

```
COMPILE SY :@OPSER
Ready
OLD.MTO:$OPSRUN
Ready
COMPILE SY :@OPSRUN
Ready
OLD MTO:$CHARS
Ready
COMPILE SY :@CHARS
Ready
RUN SY :@CHARS
Ready
OLD MTO:$SPOOL
Ready
COMPILE SY :@SPOOL
Ready
OLD MTO:$SPLIDL
Ready
COMPILE SY :@SPLIDL
Ready
OLD MTO:$SPLRUN
Ready
COMPILE SY :@SPLRUN
Ready
OLD MTO:$BATDCD
Ready
```

```
COMPILE SY :@BATDCD

Ready

RUN SY :@BATDCD
BATDCD  V06B-03 RSTS V06B-02 *TIME SHARING*


Ready

OLD MTO:$BATCH

Ready

COMPILE SY :@BATCH

Ready

OLD MTO:$BATIDL

Ready

COMPILE SY :@BATIDL

Ready

OLD MTO:$BATDEC

Ready

COMPILE SY :@BATDEC

Ready

OLD MTO:$BATRUN

Ready

COMPILE SY :@BATRUN

Ready

OLD MTO:$BACKUP

Ready

COMPILE SY :@BACKUP

Ready
```

```
OLD MTO:$BACLST

Ready

COMPILE SY :@BACLST

Ready

OLD MTO:$BACCON

Ready

COMPILE SY :@BACCON

Ready

OLD MTO:$BACDIR

Ready

COMPILE SY :@BACDIR

Ready

OLD MTO:$BACMNT

Ready

COMPILE SY :@BACMNT

Ready

OLD MTO:$BACLAB

Ready

COMPILE SY :@BACLAB

Ready

OLD MTO:$BACDSK

Ready

COMPILE SY :@BACDSK

Ready

OLD MTO:$BACKTO

Ready
```

```
COMPILE SY :@BACKTO
Ready
OLD MTO:$BACCOM
Ready
COMPILE SY :@BACCOM
Ready
OLD MTO:$BACDMP
Ready
COMPILE SY :@BACDMP
Ready
OLD MTO:$BACDEL
Ready
COMPILE SY :@BACDEL
Ready
OLD MTO:$BACLOD
Ready
COMPILE SY :@BACLOD
Ready
OLD MTO:$BACENT
Ready
COMPILE SY :@BACENT
Ready
OLD MTO:$BACFRM
Ready
COMPILE SY :@BACFRM
Ready
```

```
OLD MT0:$BACPRM

Ready

COMPILE SY :@BACPRM

Ready

RUN SY :@BACPRM
BACPRM  V06B-03 RSTS V06B-02 *TIME SHARING*

Ready

RUN $PIP
PIP     V06B-03 RSTS V06B-02 *TIME SHARING*
#SY :@PIP    .TXT<40>=MT0:$PIPEXT.TXT/FA
#SY :@RUNOFF.RNO<40>=MT0:$RUNOFF.RNO/FA
#SY :@BACKUP.HLP<40>=MT0:$BACKUP.HLP/CO
#=SY :@VT5DPY.BAC<232>/RE
#=SY :@VT50PY.BAC<232>/RE
#=SY :@QUE    .BAC<232>/RE
#=SY :@BACKUP.BAC<232>/RE
#=SY :@BACLST.BAC<232>/RE
#=SY :@BACCON.BAC<232>/RE
#=SY :@BACDIR.BAC<232>/RE
#=SY :@BACMNT.BAC<232>/RE
#=SY :@BACLAB.BAC<232>/RE
#=SY :@BACDSK.BAC<232>/RE
#=SY :@BACKTO.BAC<232>/RE
#=SY :@BACCOM.BAC<232>/RE
#=SY :@BACDMP.BAC<232>/RE
#=SY :@BACDEL.BAC<232>/RE
#=SY :@BACLOD.BAC<232>/RE
#=SY :@BACFRM.BAC<232>/RE
#^C

Ready

HELLO

RSTS V06B-02 *TIME SHARING*  Job 2  [1,2]  KB0  11-Nov-76  11:57 PM
Job 1 is detached under this account
Job number to attach to?  1
Attaching to Job 1

BUILD COMPLETE

Ready
```

The BUILD COMPLETE and READY messages signal the completion of the procedure. Dismount the distribution magtape and store it in a safe place. Then proceed to Section 6.3.

6.2.2 Building the System Library from Disk Cartridge

DIGITAL supplies the system library on two RK05 or one RK06 disk cartridge(s). To build the system library from disk cartridge, perform the following steps.

1. Mount on a free unit the system library disk cartridge labelled:

   DEC-11-ORSLA-E-HA1, SYSTEM LIBRARY DECPACK (for RK05 distribution)
   DEC-11-ORSLA-E-BA, SYSTEM LIBRARY DATA CARTRIDGE (for RK06 distribution)

2. Place the LOAD/RUN switch (on an RK05) or RUN/STOP switch (on an RK06) on the drive to its RUN position and ensure that the READY indicator comes on.
3. Ensure that the disk drive is write-protected.
4. Logically mount the distribution disk by typing the following command:

   MOUNT dev:ORSLAE/RO

   Replace dev in the command with the device name (DK or DM) and unit number of the disk. The /RO switch mounts the disk for read access only. This switch prevents the system from writing on the disk and possibly destroying important data.

6.2.2.1 Building the Standard System Library BUILD.CTL – You should execute the BUILD.CTL file on all systems. Type the following command to run the BUILD program from the disk cartridge:

RUN dev:$BUILD

BUILD prints the following questions:

```
SYSTEM BUILD? YES
TARGET SYSTEM DEVICE <SY0:>? LF
SOURCE INPUT DEVICE? DK0:
LIBRARY OUTPUT DEVICE <SY:>? LF
LIBRARY ACCOUNT <[1,2]>? LF
```

Type YES in response to the SYSTEM BUILD question and press LINE FEED in response to the TARGET SYSTEM DEVICE question to accept the default. Specify the device designator of the library distribution disk as the source input device. In response to the LIBRARY OUTPUT DEVICE question, specify the device on which the system library should be written. If you accept the default of SY:, the system library is written to the mounted disks in the public structure. Normally, only the system disk is mounted during the system library build procedure and therefore, it receives the complete system library. An RF11 disk, however, cannot hold RSTS/E and its system library. Therefore, if the system device is an RF11 disk, mount an additional public disk on which to write the system library. To logically mount the disk, type a command of the following format:

MOUNT dev:packid

Replace dev with the device name and unit number of the disk and replace packid with its pack identification label. In response to the LIBRARY ACCOUNT question, press LINE FEED to accept the default of [1, 2].

The BUILD program begins executing commands in the BUILD.CTL file. The printout for the program is the same as that in Section 6.2.1.1, except that MT0 is replaced by the disk drive designator. Upon completion of the procedure, type the following commands to dismount an RK05 distribution disk:

```
RUN $UTILTY
#DISMOUNT dev:
#EXIT
```

Replace dev with the device name and unit number of the disk. Remove the disk pack from the drive and store it in a safe place. Now proceed to Section 6.2.2.2 (to build spooling library programs) or to Section 6.3.

6.2.2.2 Building the Large Programs, SPLER.CTL – Building the programs from the SPLER.CTL file requires a user job area larger than 8K words as described in Section 6.1.2. If the distribution medium for your system is RK05 disk cartridge, you must now mount the second of the system library disks. This disk is labelled DEC-11-ORSLA-E-HA2. Follow the procedures in Section 6.2.2 to mount the disk. When you have mounted the disk, you can build the large programs from the SPLER.CTL file.

To build the large programs, type the following command:

```
RUN $BUILD
```

The program prints the following questions:

```
SYSTEM BUILD? NO
SOURCE INPUT DEVICE? DK1:
LIBRARY OUTPUT DEVICE <SY:>? LF
LIBRARY ACCOUNT <[1,2]>? LF
CONTROL FILE IS? $SPLER.CTL
```

Type NO in response to the SYSTEM BUILD question. Type the device name and unit number of the distribution disk as the source input device and press LINE FEED to use the public disk structure as the library output device. In response to the LIBRARY ACCOUNT question, press LINE FEED to accept the default of [1, 2]. Finally, type $SPLER.CTL to specify the correct control file.

BUILD begins executing commands in the file and prints messages similar to those in Section 6.2.1.2.

When the build process is complete, run the UTILTY program to dismount the distribution disk, as follows:

```
RUN $UTILTY
#DISMOUNT dev:
#EXIT
```

Replace dev with the device name and unit number of the distribution disk. Remove the disk pack from the drive and store it in a safe place. Then proceed to Section 6.3.

6.2.3 Building the System Library from DECtape

DIGITAL supplies the RSTS/E system library on ten DECtapes. Two DECtapes contain files for the standard system library. The third DECtape contains files for both the standard system library and the large programs. The other seven DECtapes contain the large programs. To build the system library from DECtape, perform the following steps:

1. Mount the DECtape reel labelled DEC-11-ORSCA-E-UA1, SYSTEM LIBRARY TAPE PART 1, on drive unit 0.
2. Mount the DECtape reel labelled DEC-11-ORSCA-E-UA2, SYSTEM LIBRARY TAPE PART 2, on drive unit 1.
3. Set the WRITE ENABLE/WRITE LOCK switch on drive 0 and drive 1 to its WRITE LOCK position.
4. Set the REMOTE/OFF/LOCAL switch on drive 0 and drive 1 to its REMOTE position.

The tape mounted on unit 0 contains BUILD.CTL, the control file for the first segment of the standard library build (PART 1). The tape mounted on unit 1 contains a second BUILD.CTL file for the second segment of the standard library build (PART 2). Ensure that the correct tapes are mounted before you proceed.

6.2.3.1 Building the Standard System Library, BUILD.CTL – You should execute the BUILD.CTL file on all systems.

Type the following command to execute the BUILD program:

```
RUN DT0:$BUILD
```

BUILD runs and prints the following questions:

```
SYSTEM BUILD? YES
TARGET SYSTEM DEVICE <SY0:>? LF
SOURCE INPUT DEVICE? DT0:
LIBRARY OUTPUT DEVICE <SY:>? LF
LIBRARY ACCOUNT <[1,2]>? LF
```

Type YES in response to the SYSTEM BUILD question and press LINE FEED in response to the TARGET SYSTEM DEVICE question to accept the default. Specify DT0: as the source input device. In response to the LIBRARY OUTPUT DEVICE question, specify the device on which the system library should be written. If you accept the default of SY:, the system library is written to the mounted disks in the public structure. Normally, only the system disk is mounted during the system library build procedure and therefore, it receives the complete system library. An RF11 disk, however, cannot hold RSTS/E and its system library. Therefore, if the system device is an RF11 disk, mount an additional public disk on which to write the system library. To logically mount the disk, type a command of the following format:

```
MOUNT dev:packid
```

Replace dev with the device name and unit number of the disk and replace packid with its pack identification label. In response to the LIBRARY ACCOUNT question, press LINE FEED to accept the default of [1,2].

The BUILD program now begins executing commands in the BUILD.CTL file.

Upon completion of the procedure, BUILD prints the BUILD COMPLETE and READY messages. Dismount the tape labelled DEC-11-ORSCA-E-UA1 from unit 0 and store it in a safe place. Mount the tape labelled DEC-11-ORSCA-E-UA3, write-locked.

Rerun the BUILD program to build the files from the second DECtape, as follows:

The program prints the following questions:

```
SYSTEM BUILD? NO
SOURCE INPUT DEVICE? DT1:
LIBRARY OUTPUT DEVICE <SY:>? LF
LIBRARY ACCOUNT <[1,2]>? LF
CONTROL FILE IS? $BUILD.CTL
```

Type NO in response to the SYSTEM BUILD question. Type DT1: as the source input device and press LINE FEED to use the public disk structure as the library output device. In response to the LIBRARY ACCOUNT question, press LINE FEED to accept the default of [1,2]. Finally, type $BUILD.CTL to specify the correct control file.

When the BUILD COMPLETE and READY messages appear, run the BUILD program once again, this time from the third DECtape (DEC-11-ORSCA-E-U3). Answer the questions as you did previously, specifying the device on which the third DECtape is mounted as the source input device.

When the BUILD COMPLETE and READY messages appear, the standard library build is complete. Dismount the tape labelled DEC-11-ORSCA-E-UA2 from unit 1 and store it in a safe place. If your system requires the large programs, leave the tape labelled DEC-11-ORSCA-E-UA3 mounted. This tape also contains large programs. Proceed to Section 6.2.3.2 to build them. If not, dismount the tape labelled DEC-11-ORSCA-E-UA3 and store it in a safe place. Then go to Section 6.3.

6.2.3.2 Building the Large Programs, SPLER.CTL – Building the large programs from the SPLER.CTL file requires a user job area larger than 8K words. To continue the build procedure, perform the following steps:

1. Mount the tape labelled DEC-11-ORSCA-E-UC4 SYSTEM LIBRARY TAPE – LARGE PROGRAMS, on a free unit.
2. Set the WRITE ENABLE/WRITE LOCK switch on the drive to its WRITE LOCK position.
3. Set the REMOTE/OFF/LOCAL switch on the drive to its REMOTE position.

Type the following command to start the procedure:

```
RUN $BUILD
```

The program prints the following questions:

```
SYSTEM BUILD? NO
SOURCE INPUT DEVICE? DT0:
LIBRARY OUTPUT DEVICE <SY:>? LF
LIBRARY ACCOUNT <[1,2]>? LF
CONTROL FILE IS? SPLER.CTL
```

Type NO in response to the SYSTEM BUILD question. Replace DT0: with the device name and unit number of the third DECtape (DEC-11-ORSCA-E-UA3) as the source input device. Press LINE FEED to use the public disk structure as the library output device. In response to the LIBRARY ACCOUNT question, press LINE FEED to accept the default of [1,2]. Finally, type SPLER.CTL to specify the correct control file.

When the BUILD COMPLETE and READY messages appear, dismount the tape labelled DEC-11-ORSCA-E-UA3. Store this tape in a safe place. Rerun the BUILD program (as in the preceding example), using the fourth DECtape (DEC-11-ORSCA-E-UA4).

When this run of the BUILD program is complete, dismount the tape and mount the tapes marked DEC-11-ORSCA-E-UA5 and DEC-11-ORSCA-E-UA6 according to the preceding procedures. Run the BUILD program for each of these tapes, then for the tapes labelled DEC-11-ORSCA-E-UA7, DEC-11-ORSCA-E-UA8, DEC-11-ORSCA-E-UA9, and DEC-11-ORSCA-E-UA10. When BUILD terminates for the final DECtape, dismount all mounted tapes, store them, and proceed to Section 6.3.

6.3 BUILDING OPTIONAL SOFTWARE

If your system will support any optional software, build that software after building the system library files. To obtain the build procedures, consult the RSTS/E Release Notes and the documentation for the software you plan to include. After building the optional software, proceed to Section 6.4 to create the ASCII text and message files.

6.4 CREATING THE ASCII TEXT AND MESSAGE FILES

Now you can run the PIP or EDIT system program and create the required ASCII text files. For information about PIP, refer to Section 17.1 of the RSTS/E System User's Guide. For information about EDIT, refer to the RSTS/E Text Editor Manual. The following five sections describe the procedures to follow when creating the ASCII text files and contain references to further descriptions of the use and contents of the files. Editing conventions for the use of the RUBOUT key and CTRL/U as described in Section 9.2.1 of the RSTS/E System User's Guide apply when you use the PIP system program.

6.4.1 System Message File NOTICE.TXT

The system prints the file NOTICE.TXT when a user successfully logs into the system as described in Section 2.1.2 of the RSTS/E System User's Guide. In this manner, you can relay to users information concerning operation of the installation or changes or additions to the system. Before creating your own NOTICE.TXT file, you can print the sample file in the library on the console terminal. The following example illustrates the procedure:

```
RUN $PIP
PIP       V06B-03 RSTS V06B-02 *TIME SHARING*
#KB:/FA=NOTICE.TXT


WELCOME TO RSTS/E V06B TIME SHARING

#
```

You can create a tailored NOTICE.TXT file to replace the sample file by imitating the following sample procedure.

```
#SY0:NOTICE.TXT=KB:/FA


HOURS OF OPERATION ARE:

        MON-SAT          8 AM TO 5 PM

        EVENINGS AND SUNDAYS BY REQUEST

^Z
#
```

The ↑Z at the end of the text file is necessary. It prints when you type the CTRL/Z* combination. It signals the end of the ASCII text, closes the file properly, and returns control to PIP as indicated by the # character. The system manager can update the file as needed.

6.4.2 System Help File HELP.TXT

When a user types HELP at a logged-out terminal, the system prints the file HELP.TXT. You can print the sample file stored in the system library by typing the following command string. (The example assumes that PIP is still running from the previous procedures.)

*See the description of control characters in Chapter 9 in the RSTS/E System User's Guide.

```
#KB:/FA=HELP.TXT

TO GET ON-LINE AND USE RSTS/E, FOLLOW THE
INSTRUCTIONS FOUND IN CHAPTER 2 OF THE
RSTS/E SYSTEM USER'S GUIDE.

#
```

If the text is satisfactory, but you need to add some local information, use the append feature of PIP, delete the old file, and rename the new file.

```
#SY0:NEW.TXT<HELP.TXT,KB:/FA

ASK MS. SMITH FOR A PROJECT-PROGRAMMER
NUMBER AND PASSWORD.

^Z
#HELP.TXT/DE
#SY0:HELP.TXT<40>=NEW.TXT/RE
#
```

You can replace the sample HELP.TXT file by using a command string similar to the one shown in Section 6.4.1.

6.4.3 Control Files START.CTL and CRASH.CTL

The INIT system program requires two control files whenever it initializes the RSTS/E system for timesharing. The use and content of both of these files are explained in Section 3.1 of the RSTS/E System Manager's Guide. The procedures described here show how to print the sample files and how to replace the sample files with versions created to suit the needs of the local installation.

These two control files must contain the information required to properly initialize the system for timesharing operations. Before you attempt to modify or replace the contents of the example files, DIGITAL strongly recommends that you become thoroughly familiar with the information presented in the RSTS/E System Manager's Guide.

The first and second commands in the following example cause the system to print the sample CRASH.CTL and START.CTL files. The third and fourth commands cause the system to replace the sample files with the files typed at the terminal.

```
#KB:/FA=START.CTL
          (THE SAMPLE FILE IS PRINTED.)
#KB:/FA=CRASH.CTL
          (THE SAMPLE FILE IS PRINTED.)
#SY0:START.CTL=KB:/FA
          (TYPE NEW VERSION.)
^Z
#SY0:CRASH.CTL=KB:/FA
          (TYPE NEW VERSION.)
^Z
#
```

When you perform the preceding procedures, the system replaces the sample files in the system library with the versions typed. Be sure to replace the START.CTL and CRASH.CTL files on the system disk.

The sample START.CTL and CRASH.CTL files use the following indirect command files:

TTY.CMD (set terminal characteristics)
SPOOL.CMD (initialize spoolers)
RTS.CMD (install auxiliary run-time systems)
CCL.CMD (define CCL commands)
ANALYS.CMD (analyze crash dumps)

Edit these files as your installation requires, following the descriptions in Chapter 3 of RSTS/E System Manager's Guide.

6.4.4 Terminal Speed Characteristics File TTYSET.SPD

You must create the terminal speed characteristics file TTYSET.SPD to set terminal speed characteristics at the start of each timesharing session. Its use and contents are explained in Section 7.4.1 of the RSTS/E System Manager's Guide. Create an entry in TTYSET.SPD for each local or remote line that allows a variable baud rate. The following sample dialogue shows how to print the sample file in the library and how to replace the sample file with the new version.

```
#KB:/FA=TTYSET.SPD
            (THE SAMPLE FILE IS PRINTED.)
#SY0:TTYSET.SPD=KB:/FA
            (TYPE NEW VERSION.)
^Z
#
```

When you perform the preceding procedures, the system replaces the sample file in the system library with the new version.

6.4.5 Standard Account File ACCT.SYS

You can use the REACT system program to create a large number of user accounts automatically. To use this convenience, create the file ACCT.SYS in the system library. The contents of the ACCT.SYS file are explained in Section 4.1.3 of the RSTS/E System Manager's Guide. A sample of ACCT.SYS is created by the BUILD program. You can print and replace this sample file by performing the following procedures. (DIGITAL suggests that you make entries in ACCT.SYS to create a privileged and a nonprivileged account for yourself and create auxiliary accounts associated with the !, #, &, and % characters.)

```
#KB:/FA=ACCT.SYS
            (THE SAMPLE FILE IS PRINTED.)
#SY0:ACCT.SYS=KB:/FA
            (TYPE NEW VERSION.)
^Z
#^Z


READY
```

The new version of ACCT.SYS replaces the sample ACCT.SYS in the system library. The PIP system program run terminates. Proceed to Section 6.5 to create the user accounts.

6.5 CREATING USER ACCOUNTS

Run the REACT system program and use the STANDARD function to create the user accounts in the MFD of the system disk. Section 4.1 of the RSTS/E System Manager's Guide describes the REACT system program. The following example illustrates the method used to create the user accounts from information in the ACCT.SYS file.

```
RUN REACT
REACT   V06B-03 RSTS V06B-02 *TIME SHARING*
SYSTEM ACCOUNT MANAGER
FUNCTION? STANDARD
ALL ACCOUNTS IN ACCOUNT FILE ARE NOW ENTERED
FUNCTION? ^Z

Ready
```

REACT prints an identification message and a request for a function. If you type STANDARD or S, the REACT program creates user accounts from information in the ACCT.SYS file. When the standard function is completed, REACT prints an advisory message and reprints the FUNCTION request. Type CTRL/Z (↑Z) to terminate REACT.

At this point, you have built the system disk and have made the RSTS/E system fully operational. DIGITAL recommends that you shut down the system as described in Section 3.2 of the RSTS/E System Manager's Guide and restart it to test the new START.CTL file.

6.6 SUMMARY OF PROCEDURES

This section summarizes the procedures you must follow to build the system library files. Figure 6-1 illustrates the flow of the procedures.

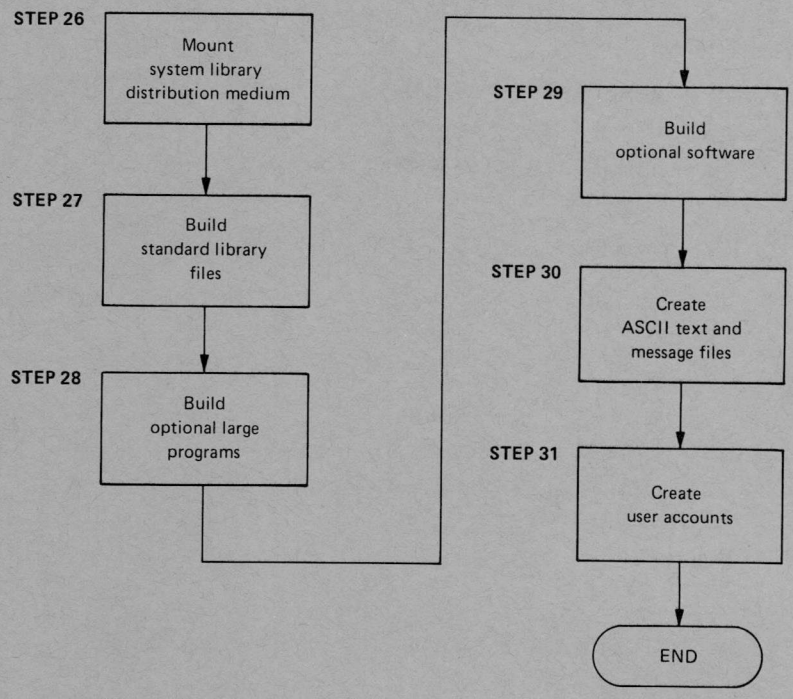

Figure 6-1 Summary of System Library Build Procedures

STEP 26. Mounting the System Library Distribution Medium

Procedure:

a. For magtape distribution:

Mount on unit 0 the tape labelled:

DEC-11-ORS1A-E-MA7 SYSTEM LIBRARY TAPE PART 1 (for a 7-track TU70 drive)

DEC-11-ORS1A-E-MA9 SYSTEM LIBRARY TAPE PART 1 (for a 9-track TU10/TS03 or TU16/TU45 drive)

Ensure that the write enable ring is removed.

Ensure that the LD PT and FILE PROT indicators are lit.

Set the ON-LINE/OFF-LINE switch to ON-LINE. Ensure that the READY light comes on.

b. For disk cartridge distribution:

Mount on a free unit the disk labelled:

DEC-11-ORSLA-E-HA1 SYSTEM LIBRARY DECPACK, PART 1 (for RK05 distribution)

DEC-11-ORSLA-E-BA SYSTEM LIBRARY DATA CARTRIDGE (for RK06 distribution)

Move the LOAD/RUN switch (on the RK05) or the STOP/RUN switch (on the RK06) on the drive to the RUN position and ensure that the READY indicator comes on.

Ensure that the WR PROT indicator is lit.

Type the following command, replacing dev with the device name and unit number of the disk:

```
MOUNT dev:ORSLAE/RO
```

c. For DECtape distribution:

Mount the DECtape reel labelled DEC-11-ORSCA-E-UA1, SYSTEM LIBRARY TAPE PART 1, on drive unit 0.

Mount the DECtape reel labelled DEC-11-ORSCA-E-UA2, SYSTEM LIBRARY TAPE PART 2, on drive unit 1.

Set the WRITE ENABLE/WRITE LOCK switch on drive 0 and on drive 1 to the WRITE LOCK position.

Set the REMOTE/OFF/LOCAL switch on drive unit 0 and on drive unit 1 to the REMOTE position.

STEP 27. Building the Standard System Library Files

Procedure:

a. Type the following command to run the BUILD program:

```
RUN xxn:$BUILD
```

Substitute the device name of the distribution medium for xx and the unit number on which it is mounted for n. Append the $ if the distribution medium is magtape or disk cartridge.

b. Answer the BUILD program questions as follows:

```
SYSTEM BUILD? YES
TARGET SYSTEM DEVICE <SY0:>? (LF)
SOURCE INPUT DEVICE? dev:
LIBRARY OUTPUT DEVICE <SY:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
```

Substitute the device name of the distribution medium and the unit number on which it is mounted for dev. For DECtape, specify unit 0.

c. When the process is complete, BUILD prints the BUILD COMPLETE and READY messages. Proceed to Step 28 for magtape and disk cartridge distribution media. For DECtape, type the command RUN BUILD and proceed as follows:

```
SYSTEM BUILD? NO
SOURCE INPUT DEVICE? DT1:
LIBRARY OUTPUT DEVICE <SY:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
CONTROL FILE IS? BUILD.CTL
```

When the BUILD COMPLETE and READY messages appear, dismount the DECtapes from units 0 and 1 and store them in a safe place. Mount the tape labelled DEC-11-ORSCA-E-UA3 on a free unit and rerun the BUILD program (as in c), specifying the correct unit number for this tape in response to the SOURCE INPUT DEVICE question. When the BUILD COMPLETE and READY messages appear, leave the DECtape mounted and proceed to Step 28.

STEP 28. Building the Large Programs

Follow the steps in this procedure only if you wish to build the programs from the SPLER.CTL file. These programs require a user job area of 16K words.

Procedure:

a. If the distribution medium is magtape, mount the tape labelled DEC-11-ORS2A-E-MA7 (7-track), or DEC-11-ORS2A-E-MA9 (9-track TU10/TS03 or TU16/TU45) on unit 0 with the write enable ring removed.

Ensure that the LD PT and FILE PROT indicators are lit.

Set the ON-LINE/OFF-LINE switch to ON-LINE. Ensure that the READY light comes on.

b. If the distribution medium is RK05 disk cartridge, mount the disk labelled DEC-11-ORSLA-E-HA2, SYSTEM LIBRARY DECPACK PART 2 on a free unit. If no disk unit is free, run the UTILTY program and issue the DISMOUNT command to logically dismount the first system library distribution disk. The following is the procedure:

```
RUN $UTILTY
#DISMOUNT dev:
#EXIT
```

Replace dev in the example with the device name and unit number of the disk. Unload the disk and remove the pack from the drive. Then mount the second disk.

Move the LOAD/RUN switch to the RUN position and ensure that the READY indicator comes on.

Ensure that the WR PROT indicator is lit.

Type the following command to logically mount the disk:

```
MOUNT dev:ORSLAE/RO
```

Replace dev in the command with the device name and unit number of the disk.

c. If the distribution medium is DECtape, mount the tape labelled DEC-11-ORSCA-E-UC4, SYSTEM LIBRARY TAPE PART 4, on a free unit.

Set the WRITE ENABLE/WRITE LOCK switch the unit to the WRITE LOCK position.

Set the REMOTE/OFF/LOCAL switch on the unit to the REMOTE position.

d. Type the following command to run the BUILD program:

```
RUN $BUILD
```

Answer the questions as follows:

```
SYSTEM BUILD? NO
SOURCE INPUT DEVICE? dev:
LIBRARY OUTPUT DEVICE <SY:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
CONTROL FILE IS? $SPLER.CTL
```

Substitute the device name of the distribution medium and the unit number on which it is mounted for dev. For DECtape, specify the device unit on which the third tape (DEC-11-ORSCA-E-UA3) is mounted.

When the process is complete, BUILD prints the BUILD COMPLETE and READY messages. If the distribution medium is magtape, dismount the tape and store it in a safe place. If the distribution medium is disk, use the UTILTY program to logically dismount it as in step b. Physically remove the pack from the drive and store it in a safe place.

If the distribution medium is DECtape, run the BUILD program seven more times – once for each of the DECtapes labelled DEC-11-ORSCA-E-UC4 through DEC-11-ORSCA-E-UC10. Mount each of the tapes and ensure that it is write locked before you run BUILD for that tape. When the BUILD COMPLETE and READY messages appear for the tape labelled DEC-11-ORSCA-E-UC10, the build process is complete.

STEP 29. Building Optional Software

Procedure:

If your system includes any optional RSTS/E software, such as RJ2780, COBOL, FORTRAN, or RMS-11, follow the building procedures for that software. Consult the RSTS/E Release Notes and the appropriate documentation for the optional software to obtain the building procedures.

STEP 30. Creating the ASCII Text and Message Files

Procedure:

a. Use the PIP system program to create the ASCII files NOTICE.TXT, HELP.TXT, START.CTL, CRASH.CTL, TTYSET.SPD, and ACCT.SYS. To print the current version of any of these files, use a command to PIP of the following form:

```
#filnam.ext
```

Replace filnam.ext with the name and extension of the file you wish to list.

b. To create a new version of a file, use the following command string:

```
#SY0:filnam.ext=KB:/FA
```

Replace filnam.ext in the command with the name and extension of the file to replace. If you replace NOTICE.TXT or HELP.TXT, include <40> as part of the filename to make <40>the protection code of the file. If you accept the default protection code of <60>, the system does not print the files for non-privileged users.

STEP 31. Creating User Accounts

Procedure:

a. Use the REACT system program to create all accounts in the file ACCT.SYS. Proceed as follows:

```
RUN REACT
REACT V06B-03 RSTS V06B-02
FUNCTION? STANDARD
```

```
ALL ACCOUNTS IN $ACCT.SYS ARE NOW ENTERED
FUNCTION?↑Z
READY
```

b. DIGITAL recommends that you now shut down the system (by running SHUTUP) and then restart it to test the new START.CTL file.

CHAPTER 7

REGENERATING RSTS/E SOFTWARE DURING TIMESHARING

You can generate additional RSTS/E monitors and/or BASIC-PLUS run-time systems on-line during timesharing. These files can replace the existing versions or can be retained on the system disk for occasional use. To generate a monitor or run-time system, first ensure that the necessary system generation files are available and (when generating a run-time system) that sufficient contiguous space exists on the system disk. Next, answer the configuration questions and start the batch control file following essentially the same procedures as described in Chapter 4. When the batch run terminates, the monitor and/or run-time system generation is complete. You can then tailor (and install, if necessary) the monitor and/or make the run-time system available for use.

7.1 PREPARING FOR ON-LINE GENERATION

Before you can begin to generate a monitor or BASIC-PLUS run-time system on-line, the public disk structure must contain the system generation files and RT11 must be added as a run-time system. A pseudo keyboard must also be available. In addition, if you plan to generate BASIC-PLUS, ensure that the system disk contains enough contiguous space for the run-time system file.

7.1.1 Finding Contiguous Space for BASIC-PLUS

Run-time system files must occupy contiguous disk space. Therefore, you should ensure that sufficient contiguous space exists on the system disk before you generate an additional BASIC-PLUS run-time system. If you previously allocated extra contiguous space as a dummy or extra-large file, you can simply delete or reduce the size of that file. If you did not originally plan extra contiguous space, you can use a BASIC-PLUS OPEN statement with the contiguous MODE specification to open a file of the approximate size. If the system executes the statement without error, the space exists. If the statement fails, you must delete some files or transfer some files to other media in order to free contiguous disk space. You can then begin to generate the BASIC-PLUS run-time system.

7.1.2 Obtaining the System Generation Files

On-line generation of the monitor or BASIC-PLUS requires that the files SYSGEN.SAV, SYSBAT.SAV, MACRO.SAV, CREF.SAV, PIP.SAV, LINK.SAV, SILUS.SAV, HOOK.SAV, and ERR.STB be in the system library account [1,2]. The CREATE batch stream copies these files from the distribution medium to the SYSGEN system disk during the initial system generation.

If the target system was written on a system tape or on a disk other than the SYSGEN disk, the files may not be available on the system disk. Ascertain whether the files exist on the system disk. If not, follow the procedures in Chapter 2 to mount the distribution medium. Use the MOUNT command to logically mount the distribution disk.

After mounting the distribution medium, use PIP.BAC to create RT11.RTS in account [0,1] on the system disk. Then use UTILTY to add RT11 as a run-time system. The following is an example of this procedure:

```
RUN $PIP
PIP      V06B-03 RSTS V06B-02 *TIME SHARING*
*SY0:[0,1]RT11.RTS/CL:32/CO:T=DK1:[0,1]RT11.RTS
*^Z

Ready
```

```
RUN $UTILTY
UTILTY  V06B-03 RSTS V06B-02 *TIME SHARING*
#ADD RT11
#^Z

Ready
```

Replace DK1 in the example with the device name and unit number of your distribution medium.

Follow the procedures in Chapter 4 to run the CREATE batch stream. This batch stream copies the remaining required files to the system disk under the logged-in account and chains to SYSGEN.SAV, which asks the configuration questions.

If the target system was output to the SYSGEN system disk during the previous system generation, the files remained on the disk. In this case, you need not recopy them. You must, however, add the file RT11.RTS as a run-time system. Run the UTILTY program and use the ADD RTS command to do so. You can then simply type the command RUN $SYSGEN, which runs the program SYSGEN.SAV, as in the following example.

```
RUN $SYSGEN

**12-Nov-76**


Beginning of RSTS/E  system  generation.

Questions come in long and short  forms.
If  you  are  familiar with them, answer
"S" for short; otherwise, answer "L" for
```

7.2 GENERATING THE MONITOR OR BASIC-PLUS RUN-TIME SYSTEM

Answer the configuration questions to include the features required by the monitor and/or run-time system. The SYSGEN program asks a subset of the configuration questions if you are generating only a monitor or a run-time system. When generating a monitor or run-time system for an existing system disk, be sure to assign the new file a different name from the installed file. If necessary, you can generate a monitor or run-time system for a new target medium.

When you have answered all the configuration questions, type RUN $SYSBAT to start the batch process. When the execution of the batch file is complete, the new monitor or run-time system resides in account [0,1] on the system disk.

7.3 TAILORING A NEW MONITOR

After the batch process ends, you can shut down the system and tailor the new monitor whenever it is convenient to do so. To tailor and install the monitor, follow the procedures in Sections 5.2 through 5.7. If the monitor runs on an existing system disk, you may not need to re-allocate system files. List the file status table (using the LIST suboption of the REFRESH initialization option) to ascertain any necessary changes.

7.4 PREPARING THE NEW RUN-TIME SYSTEM FOR USE

You can use the new BASIC-PLUS run-time system as the system default or as an auxiliary run-time system.

To install a new default run-time system, shut down the system. Use the REFRESH option (Section 3.7) to delete the current default run-time system (if you do not plan to use it again). Next, use the DEFAULT option (Section 3.8) and specify the new run-time system as the default. Finally, use the START option (Section 3.10) to start timesharing with the new default run-time system.

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DEC-11-ORGNA-B-D

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```
Ready

OLD DK1:$BACPRM

Ready

COMPILE SY :@BACPRM

Ready

RUN SY :@BACPRM
BACPRM  V06B-03 RSTS V06B-02 *TIME SHARING*

Ready

RUN $PIP
PIP     V06B-03 RSTS V06B-02 *TIME SHARING*
#SY :@PIP    .TXT<40>=DK1:$PIPEXT.TXT/FA
#SY :@RUNOFF.RNO<40>=DK1:$RUNOFF.RNO/FA
#SY :@BACKUP.HLP<40>=DK1:$BACKUP.HLP/CO
#=SY :@VT5DPY.BAC<232>/RE
#=SY :@VT50PY.BAC<232>/RE
#=SY :@QUE    .BAC<232>/RE
#=SY :@BACKUP.BAC<232>/RE
#=SY :@BACLST.BAC<232>/RE
#=SY :@BACCON.BAC<232>/RE
#=SY :@BACDIR.BAC<232>/RE
#=SY :@BACMNT.BAC<232>/RE
#=SY :@BACLAB.BAC<232>/RE
#=SY :@BACDSK.BAC<232>/RE
#=SY :@BACKTO.BAC<232>/RE
#=SY :@BACCOM.BAC<232>/RE
#=SY :@BACDMP.BAC<232>/RE
#=SY :@BACDEL.BAC<232>/RE
#=SY :@BACLOD.BAC<232>/RE
#=SY :@BACFRM.BAC<232>/RE
#^C

Ready

HELLO

RSTS V06B-02 *TIME SHARING*  Job 2  [1,2]  KB0  11-Nov-76  10:56 PM
Job 1 is detached under this account
Job number to attach to?  1
Attaching to Job 1

BUILD COMPLETE

Ready
```

```
Ready
COMPILE SY :@BACKTO
Ready
OLD DK1:$BACCOM
Ready
COMPILE SY :@BACCOM
Ready
OLD DK1:$BACDMP
Ready
COMPILE SY :@BACDMP
Ready
OLD DK1:$BACDEL
Ready
COMPILE SY :@BACDEL
Ready
OLD DK1:$BACLOD
Ready
COMPILE SY :@BACLOD
Ready
OLD DK1:$BACENT
Ready
COMPILE SY :@BACENT
Ready
OLD DK1:$BACFRM
Ready
COMPILE SY :@BACFRM
```

```
Ready
OLD DK1:$BACLST
Ready
COMPILE SY :@BACLST
Ready
OLD DK1:$BACCON
Ready
COMPILE SY :@BACCON
Ready
OLD DK1:$BACDIR
Ready
COMPILE SY :@BACDIR
Ready
OLD DK1:$BACMNT
Ready
COMPILE SY :@BACMNT
Ready
OLD DK1:$BACLAB
Ready
COMPILE SY :@BACLAB
Ready
OLD DK1:$BACDSK
Ready
COMPILE SY :@BACDSK
Ready
OLD DK1:$BACKTO
```

```
Ready

OLD DK1:$BATDCD

Ready

COMPILE SY :@BATDCD

Ready

RUN SY :@BATDCD
BATDCD  V06B-03 RSTS V06B-02 *TIME SHARING*


Ready

OLD DK1:$BATCH

Ready

COMPILE SY :@BATCH

Ready

OLD DK1:$BATIDL

Ready

COMPILE SY :@BATIDL

Ready

OLD DK1:$BATDEC

Ready

COMPILE SY :@BATDEC

Ready

OLD DK1:$BATRUN

Ready

COMPILE SY :@BATRUN

Ready

OLD DK1:$BACKUP

Ready

COMPILE SY :@BACKUP
```

```
COMPILE SY :@QUMRUN

Ready

OLD DK1:$OPSER

Ready

COMPILE SY :@OPSER

Ready

OLD DK1:$OPSRUN

Ready

COMPILE SY :@OPSRUN

Ready

OLD DK1:$CHARS

Ready

COMPILE SY :@CHARS

Ready

RUN SY :@CHARS

Ready

OLD DK1:$SPOOL

Ready

COMPILE SY :@SPOOL

Ready

OLD DK1:$SPLIDL

Ready

COMPILE SY :@SPLIDL

Ready

OLD DK1:$SPLRUN

Ready

COMPILE SY :@SPLRUN
```

```
COMPILE SY :@VT5DPY

Ready

OLD DK1:$DISPLY

Ready

APPEND DK1:$VT50  .DPY

Ready

COMPILE SY :@VT50PY

Ready

OLD DK1:$RUNOFF

Ready

COMPILE SY :@RUNOFF<40>

Ready

OLD DK1:$FLINT

Ready

COMPILE SY :@FLINT<40>

Ready

OLD DK1:$QUE

Ready

COMPILE SY :@QUE

Ready

OLD DK1:$QUEMAN

Ready

COMPILE SY :@QUEMAN

Ready

OLD DK1:$QUMRUN

Ready
```

```
RUN $UTILTY
#DISMOUNT DK1:
#EXIT

MOUNT DK1:ORSLAE/RO

Ready                                                    Sect. 6.2.2
                                                         Step 28
RUN$BUILD
BUILD   V06B-03 RSTS V06B-02 *TIME SHARING*
SYSTEM BUILD? NO
SOURCE INPUT DEVICE? DK1:
LIBRARY OUTPUT DEVICE <SY:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
CONTROL FILE IS? $SPLER.CTL
^C
HELLO

RSTS V06B-02 *TIME SHARING*  Job 2  KB0  11-Nov-76  10:19 PM
# 1 / 2
Password:
Job 1 is detached under this account
Job number to attach to?
1 other user is logged in under this account




Ready

ASSIGN [1,2]

Ready


!********** SPLER.CTL - LARGE PROGRAM BUILD

OLD DK1:$PIPEXT

Ready

COMPILE SY :@PIP<40>

Ready

OLD DK1:$DISPLY

Ready

APPEND DK1:$VT05  .DPY

Ready
```

```
#SY0:@SPOOL .CMD     =DK1:$SPOOL .CMD/FA
#SY0:@RTS   .CMD     =DK1:$RTS   .CMD/FA
#SY0:@CCL   .CMD     =DK1:$CCL   .CMD/FA
#SY0:@CRASH .CTL     =DK1:$CRASH .CTL/FA
#SY0:@ANALYS.CMD     =DK1:$ANALYS.CMD/FA
#SY0:@UTILTY.TXT     =DK1:$UTILTY.TXT/FA
#SY0:@ERRDAT.FIL     =DK1:$ERRDAT.FIL/CO
#SY0:@PIP   .TXT<40>=DK1:$PIP   .TXT/FA
#SY0:@DIRECT.HLP<40>=DK1:$DIRECT.HLP/FA
#SY0:@TTYSET.SPD     =DK1:$TTYSET.SPD/FA
#SY :@ERRDIS.HLP     =DK1:$ERRDIS.HLP/FA
#SY :@ACCT  .SYS     =DK1:$ACCT  .SYS/FA
#SY :@COPY  .TXT<40>=DK1:$COPY  .TXT/FA
#=SY0:@LOGIN .BAC<232>/RE
#=SY0:@LOGOUT.BAC<232>/RE
#=SY0:@DIRECT.BAC<232>/RE
#=SY0:@TTYSET.BAC<232>/RE
#=SY0:@SYSTAT.BAC<232>/RE
#=SY :@UMOUNT.BAC<232>/RE
#=SY :@QUOLST.BAC<232>/RE
#=SY :@GRIPE .BAC<232>/RE
#=SY :@TALK  .BAC<232>/RE
#=SY :@PLEASE.BAC<232>/RE
#=SY :@INUSE .BAC<232>/RE
#^C

Ready

RUN SY0:@UTILTY
UTILTY  V06B-03 RSTS V06B-02 *TIME SHARING*
#LOGINS
#EXIT

Ready

^C

Ready

HELLO

RSTS V06B-02 *TIME SHARING*  Job 2  [1,2]  KB0  11-Nov-76  10:13 PM
Job 1 is detached under this account
Job number to attach to?  1
Attaching to Job 1

BUILD COMPLETE

Ready
```

```
Ready

COMPILE SY :@QUOLST

Ready

OLD DK1:$MONEY

Ready

COMPILE SY :@MONEY<40>

Ready

OLD DK1:$GRIPE

Ready

COMPILE SY :@GRIPE

Ready

OLD DK1:$TALK

Ready

COMPILE SY :@TALK

Ready

OLD DK1:$PLEASE

Ready

COMPILE SY :@PLEASE

Ready

OLD DK1:$INUSE

Ready

COMPILE SY :@INUSE

Ready

RUN SY0:@PIP
PIP     V06B-03  - RSTS V06B-02 *TIME SHARING*
#SY0:@NOTICE.TXT<40>=DK1:$NOTICE.TXT/FA
#SY0:@HELP  .TXT<40>=DK1:$HELP  .TXT/FA
#SY0:@START .CTL    =DK1:$START .CTL/FA
#SY0:@TTY   .CMD    =DK1:$TTY   .CMD/FA
```

```
Ready
OLD DK1:$REACT
Ready
COMPILE SY :@REACT
Ready
OLD DK1:$REORDR
Ready
COMPILE SY :@REORDR
Ready
OLD DK1:$DSKINT
Ready
COMPILE SY :@DSKINT
Ready
OLD DK1:$UMOUNT
Ready
COMPILE SY :@UMOUNT
Ready
OLD DK1:$COPY
Ready
COMPILE SY :@COPY<40>
Ready
OLD DK1:$FILCOM
Ready
COMPILE SY :@FILCOM<40>
Ready
OLD DK1:$QUOLST
```

```
Ready
COMPILE SY :@ERRDIS
Ready
OLD DK1:$ERRDET
Ready
COMPILE SY :@ERRDET
Ready
OLD DK1:$ANALYS
Ready
COMPILE SY :@ANALYS
Ready
OLD DK1:$ANALY1
Ready
COMPILE SY :@ANALY1
Ready
OLD DK1:$SYSCAT
Ready
COMPILE SY :@SYSCAT
Ready
OLD DK1:$PRIOR
Ready
COMPILE SY :@PRIOR
Ready
OLD DK1:$ODT
Ready
COMPILE SY :@ODT
```

```
OLD DK1:$DIRECT

Ready
COMPILE SY0:@DIRECT

Ready
OLD DK1:$TTYSET

Ready

COMPILE SY0:@TTYSET

Ready
OLD DK1:$SYSTAT

Ready

COMPILE SY0:@SYSTAT

Ready
OLD DK1:$EDIT

Ready

COMPILE SY0:@EDIT<40>

Ready

OLD DK1:$EDITCH

Ready

COMPILE SY0:@EDITCH<40>

Ready

OLD DK1:$BUILD

Ready

COMPILE SY0:@BUILD

Ready

OLD DK1:$ERRDIS
```

```
Ready
COMPILE SY0:@UTILTY
Ready
OLD DK1:$UTILT1
Ready
COMPILE SY0:@UTILT1
Ready
OLD DK1:$INIT
Ready
COMPILE SY0:@INIT
Ready
OLD DK1:$SHUTUP
Ready
COMPILE SY0:@SHUTUP
Ready
OLD DK1:$ERRINT
Ready
COMPILE SY0:@ERRINT
Ready
OLD DK1:$ERRCPY
Ready
COMPILE SY0:@ERRCPY
Ready
OLD DK1:$PIP
Ready
COMPILE SY0:@PIP<40>
Ready
```

```
TARGET SYSTEM DEVICE <SY0:>? LF
SOURCE INPUT DEVICE? DK1:
LIBRARY OUTPUT DEVICE <SY:>? LF
LIBRARY ACCOUNT <[1,2]>? LF
ASSIGN [1,2]
OLD DK1:$LOGIN
COMPILE SY0:@LOGIN
CHAIN 'DK1:$BUILD' 9200

Ready


Ready


Ready


Ready

^C
HELLO

RSTS V06B-02 *TIME SHARING*  Job 2  KB0  11-Nov-76  10:01 PM
# 1 / 2
Password:
Job 1 is detached under this account
Job number to attach to?
1 other user is logged in under this account




Ready

ASSIGN [1,2]

Ready


!********** BUILD.CTL - STANDARD LIBRARY PROGRAMS

OLD DK1:$LOGOUT

Ready

COMPILE SY0:@LOGOUT

Ready

OLD DK1:$UTILTY
```

```
Option: SET

  SET suboption? LP
  Type (NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB)? LP
  Width (80)? 132
  Lower case (no)? LF

  SET suboption? DISABLE
  Device? DK
  Unit? 2-3
  Unit? LF
  Device? LF

  SET suboption? LIST
  Device? DK

  Name  Control Comments

  DK0   RK:
  DK1   RK:
  DK2   RK:     Disabled
  DK3   RK:     Disabled

  SET suboption? EXIT
```

Sect. 5.6
Step 24

```
Option: START

You currently have: JOB MAX = 20, SWAP MAX = 16K.

JOB MAX or SWAP MAX changes? LF

Any memory allocation changes? LF

You currently have crash dump enabled.

Crash dump? LF

11-Nov-76? LF
21:58? LF
?Can't find file or account
?Program lost-Sorry

Ready
```

Sect. 5.7
Step 25

```
MOUNT DK1:ORSLAE/RO

Ready

RUN DK1:$BUILD
BUILD   V06B-03 RSTS V06B-02 *TIME SHARING*
SYSTEM BUILD? YES
```

Sect. 6.2.2
Step 26

Sect. 6.2.2.1
Step 27

```
  New JOB MAX? (LF)

  New SWAP MAX? 16

You currently have: JOB MAX = 20, SWAP MAX = 16K.

JOB MAX or SWAP MAX changes? (LF)

Run Time System? BASIC

Error message file? ERR

Installation name? *TIME SHARING*

  Memory allocation table:

    0K: 00000000 - 00137777 (  24K) : EXEC
   24K: 00140000 - 00233777 (  15K) : RTS (BASIC)
   39K: 00234000 - 00577777 (  57K) : USER
   96K: 00600000 - End              : NXM


  Table suboption? PARITY

  Parity register usage:

    0K: 00000000 - 00577777 (  96K) : NO
   96K: 00600000 - End              : NXM


  Table suboption? XBUF

    Extended buffer address range is? 80K-95K

  Table suboption? LIST

  Memory allocation table:

    0K: 00000000 - 00137777 (  24K) : EXEC
   24K: 00140000 - 00233777 (  15K) : RTS (BASIC)
   39K: 00234000 - 00477777 (  41K) : USER
   80K: 00500000 - 00577777 (  16K) : XBUF
   96K: 00600000 - End              : NXM


  Table suboption? EXIT

You currently have crash dump disabled.

Crash dump? YES

Magtape labelling default (none)? DOS
```

```
  Size? 6

  Base? LF

CRASH.SYS changes? Y

  Size? 34

  Base? LF

Other files? LF

REFRESH suboption? LIST

  File                          File          Current   Minimum     Start
  Name        Required?  Flags  Status        Size      Size        LBN

System files:

  SWAP  .SYS    YES    NOD CTG    OK          1280        64        2201
  SWAP0 .SYS     NO               OK
  SWAP1 .SYS     NO               OK
  SWAP3 .SYS     NO               OK
  OVR   .SYS     NO               OK                      43
  ERR   .SYS     NO               OK                       8
  BUFF  .SYS    YES    NOD CTG    OK             6         6         511
  CRASH .SYS     NO    NOD CTG    OK            34        34         517

Others:

  BADB  .SYS           NOD                      0
  SATT  .SYS           NOD CTG                  1                    5
  INIT  .SYS                                  210
  ERR   .ERR               CTG                 8                  225
  RSTS  .SIL           NOD CTG                209
  BASIC .RTS               CTG                 68                  443


  REFRESH suboption? EXIT


Option: DEFAULT

No defaults are currently set

You currently have: JOB MAX = 20, SWAP MAX = 8K.

JOB MAX or SWAP MAX changes? Y
```

Sect. 5.5
Step 23

Sect. 5.4
Step 22

```
11-Nov-76? LF
21:49? LF

Disk? LF

Clean? LF

  REFRESH suboption? LIST

  File                          File          Current   Minimum     Start
  Name       Required?  Flags Status          Size      Size        LBN

System files:

  SWAP   .SYS    YES             CRE                      64
  SWAP0  .SYS     NO             OK
  SWAP1  .SYS     NO             OK
  SWAP3  .SYS     NO             OK
  OVR    .SYS     NO             OK                       43
  ERR    .SYS     NO             OK                        8
  BUFF   .SYS    YES             CRE                       6
  CRASH  .SYS     NO             OK                       34

Others:

  BADB   .SYS              NOD                0
  SATT   .SYS          NOD CTG                1                      5
  INIT   .SYS                               210
  ERR    .ERR              CTG                8                    225
  RSTS   .SIL          NOD CTG              209
  BASIC  .RTS              CTG               68                    443


  REFRESH suboption? CHANGE

  SWAP.SYS changes? Y

    Size? 1280

    Base? 2200

  SWAP0.SYS changes? LF

  SWAP1.SYS changes? LF

  SWAP3.SYS changes? LF

  OVR.SYS changes? LF

  ERR.SYS changes? LF

  BUFF.SYS changes? Y
```

```
  .R PIP.SAV
  *SYSPAK:[0,1]*.*/MODE:16.=BASIC.RTS
  *^C


Dismount DK0:
  .DEASSIGN  SYSPAK

  .R LOGOUT
  Confirm: Y
  Saved all disk files; 2378 blocks in use
  Job 2 User 1,2 logged off KB1 at 11-Nov-76 09:46 PM
  1 other user still logged in under this account
  System RSTS V06B-02 *TIME SHARING*
  Run time was 8 minutes, 13.3 seconds
  Elapsed time was 30 minutes
  Good evening



Batch job completed.
```

Sect. 4.4
Step 16

```
.R UTILTY
*NO LOGINS
*SHUTUP


RSTS V06B-02 *TIME SHARING* (DK1)
```

Sect. 5.1
Step 17

```
Option: BOOT
  Boot device: DK
  Boot unit: 0


RSTS V06B (DK0)
```

Sect. 5.2
Step 20

```
Option: INSTALL

  SIL? RSTS

Option: REFRESH
```

```
*ORSPAE:$MX/C
*ORSPAE:$SN/C
*ORSPAE:$TI/C
*ORSPAE:$DA/C
*ORSPAE:$VE
ROUND SECTION:
? PA


*^C

.R PIP.SAV
*PRT:*.*=BASIC.MAP
*^C

.R SILUS.SAV
*BASIC.RTS=BASIC
*^C

.DEASSIGN  PRT

.DEASSIGN  LP0:


Dismount DK0:
  .DEASSIGN  ORSPAE


MOUNT THE NEWLY INITIALIZED DISK "SYSPAK" ON A DISK DRIVE

READY AND WRITE ENABLE THE DRIVE

Mount DK:"SYSPAK"-write enabled
Unit ? 0
  .ASSIGN  DK0:

  .ASSIGN  DK0: SYSPAK

  .R PIP.SAV
  *SYSPAK:[0,1]*.*=SY0:[0,1]INIT.SYS
  *^C

  .R HOOK.SAV
  *SYSPAK:[0,1]INIT.SYS
  Hook complete
  *^C

  .R PIP.SAV
  *SYSPAK:[0,1]*.*/CLU:-8./MODE:16.=SY0:[0,1]ERR.ERR
  *SYSPAK:[0,1]*.*=RSTS.SIL
  *^C
```

```
.R LINK.SAV
*EMT/Z,EMT/A,EMT=ORSPAE:$EMT,DK:RSTS.STB/X/B:#117000/U:#1000/C
*ORSPAE:$RSTS
ROUND SECTION:
? EMTPAT


*^C

.R LINK.SAV
*FIP/Z,FIP/A,FIP=ORSPAE:$FIP,DK:RSTS.STB/X/B:#117000/U:#1000/I/C
*ORSPAE:$RSTS
ROUND SECTION:
? FIPPAT
LIBRARY SEARCH:
? OPN
? UUO
? SND
?


*^C

.R LINK.SAV
*OVR/Z,OVR/A,OVR=ORSPAE:$OVR,DK:FIP.STB,ORSPAE:$RSTS/X/B:#1000


*^C

.R PIP.SAV
*PRT:*.*=RSTS.MAP,EMT.MAP,FIP.MAP,OVR.MAP
*^C

.R SILUS.SAV
*RSTS.SIL=RSTS,EMT/M,FIP/M/C
*OVR/M/C
*ORSPAE:$ODT,$DEFALT
*^C

.R PIP.SAV
*BASIC.SAV,BASIC.STB/D
?Can't find file or account - file BASIC .SAV - continuing
?Can't find file or account - file BASIC .STB - continuing
*^C

.R LINK.SAV
*BASIC/Z,BASIC/A,BASIC=ORSPAE:$RTS,DK:$ERR.STB/X/H:#177776/U:#4000/C
*ORSPAE:$MA2I/C
*ORSPAE:$XL2I/C
*ORSPAE:$XT2I/C
*ORSPAE:$IO/C
*ORSPAE:$PU/C
```

```
?Can't find file or account - file RSTS   .SAV - continuing
?Can't find file or account - file EMT    .SAV - continuing
?Can't find file or account - file FIP    .SAV - continuing
?Can't find file or account - file OVR    .SAV - continuing
?Can't find file or account - file NSP    .SAV - continuing
?Can't find file or account - file RJ2780.SAV - continuing
*RSTS.MAP,EMT.MAP,FIP.MAP,OVR.MAP,NSP.MAP,RJ2780.MAP/D
?Can't find file or account - file RSTS   .MAP - continuing
?Can't find file or account - file EMT    .MAP - continuing
?Can't find file or account - file FIP    .MAP - continuing
?Can't find file or account - file OVR    .MAP - continuing
?Can't find file or account - file NSP    .MAP - continuing
?Can't find file or account - file RJ2780.MAP - continuing
*RSTS.STB,EMT.STB,FIP.STB,OVR.STB,NSP.STB,RJ2780.STB/D
?Can't find file or account - file RSTS   .STB - continuing
?Can't find file or account - file EMT    .STB - continuing
?Can't find file or account - file FIP    .STB - continuing
?Can't find file or account - file OVR    .STB - continuing
?Can't find file or account - file NSP    .STB - continuing
?Can't find file or account - file RJ2780.STB - continuing
*^C

.R MACRO.SAV
*TBL,TBL/C=ORSPAE:$COMMON,$KERNEL,DK:CONFIG,ORSPAE:$CHECK,$TBL
ERRORS DETECTED: 0
FREE CORE: 9704. WORDS

*^C

.R MACRO.SAV
*TTDVR,TTDVR/C=ORSPAE:$COMMON,$KERNEL,DK:CONFIG,ORSPAE:$CHECK,$KBDEF,$
TTDVR
ERRORS DETECTED: 0
FREE CORE: 8467. WORDS

*^C

.R LINK.SAV
*RSTS/Z,RSTS/A,RSTS=TBL,$ERR.STB/X/B:0/U:#1000/I/C
*ORSPAE:$RSTS/C
*TTDVR
ROUND SECTION:
? MORBUF
LIBRARY SEARCH:
? BUF
? DKSEEK
?


*^C
```

```
The system generation  dialog is finish-
ed.  If you have any special requirements
which require editing the generated file
CONFIG.MAC(system configuration file) or
SYSGEN.CTL(batch control file)  you  may
do it now.  When  ready type "R SYSBAT".

.R SYSBAT
```

Sect. 4.3
Step 15

```
SYSGEN  batch  processing  has  started.
If any problems develop during the batch
process  it  may  be aborted  by  typing
"Control/C".  To restart type "R SYSBAT".


  ^C
  HELLO 1/2
  Password:
  1 other user is logged in under this account

  .

MOUNT DEC-11-ORSPA-E-HC ON A DISK DRIVE

READY AND WRITE PROTECT THE DRIVE

Mount DK:"ORSPAE"-write locked
Unit ? 0
  .ASSIGN  DK0:

  .ASSIGN  DK0: ORSPAE


Specify LP unit
Unit ? 0
  .ASSIGN  LP0:

  .ASSIGN  LP0: PRT

  .R PIP.SAV
  *TBL.OBJ,TTDVR.OBJ/D
  ?Can't find file or account - file TBL    .OBJ - continuing
  ?Can't find file or account - file TTDVR  .OBJ - continuing
  *TBL.LST,TTDVR.LST/D
  ?Can't find file or account - file TBL    .LST - continuing
  ?Can't find file or account - file TTDVR  .LST - continuing
  *RSTS.SAV,EMT.SAV,PIP.SAV,OVR.SAV,NSP.SAV,RJ2780.SAV/D
```

```
P.T. punch ?                        *Y *  LF
DECNET network support ?            #NO#  LF
2780 support ?                      #NO#  LF
Maximum jobs ?                      #10#    20
Small buffers ?                     #260#  LF
System wide logicals ?              #10#  LF
Delay factor ?                      #001#  LF
FIP bufferins ?                     #Y #  LF
Resident disk handlins ?            #Y #  LF
Resident send/receive ?             #NO#    Y
Resident simple SYS calls ?         #NO#    Y
Resident file delete/rename ?       #NO#  LF
Res. losin/attach/attribute ?       #NO#  LF
Resident catalos/lookup ?           #NO#  LF

The followins questions deal with the
BASIC-PLUS run-time system

FPP ?                               *NO*  LF
FIS ?                               *Y *  LF
Math precision ?                    #02#  LF
Functions ?                         #Y #  LF
Time format ?                       #AM#  LF
Alphabetic month ?                  #Y #  LF
Print usins ?                       #Y #  LF
Matrices ?                          #NO#    Y
Strins arithmetic ?                 #NO#  LF
```

```
DL11E's ?                          *01* LF
DJ11's ?                           *00* LF
DH11's ?                           *01* LF
DH11 unit 00 lines enabled ?       #16# LF
Dataset support for DH11's ?       *NO* LF
DZ11's ?                           *00* LF
Pseudo keyboards ?                 #04#     8
2741 support ?                     #NO# LF
Multi-terminal service ?           #Y # LF
Echo control ?                     #Y # LF
RC11/RS64's ?                      *NO* LF
RF/RS11's ?                        *NO* LF
RS03/RS04's ?                      *00* LF
RK05's ?                           #08#     4
Overlapped seek ?                  *Y * LF
RK06's ?                           *00* LF
RP02/RP03's ?                      *00* LF
RP04/RP05/RP06's ?                 *00* LF
TU16's ?                           *00* LF
TU10's ?                           #08#     3
DECtapes ?                         #08#     2
Printers ?                         *01* LF
RX01's ?                           *00* LF
CR11/CM11 card reader ?            *NO* LF
CD11 card reader ?                 *NO* LF
P.T. reader ?                      *Y * LF
```

Sect. 4.2
Step 14

```
**11-Nov-76**

Beginning of RSTS/E  system  generation.


Questions come in long and short  forms.
If  you  are  familiar with them, answer
"S" for short; otherwise, answer "L" for
long form.

Form  ?                          *S *<LF>

Same system ?                    *Y *<LF>

Distribution medium ?            *??*     DK

Output medium ?                  *DK*<LF>

Pack ID ?                        *??*     SYSPAK

Delete files ?                   *NO*<LF>

LP for SYSGEN ?                  *Y *<LF>

Generate monitor ?               *Y *<LF>

Monitor name ?                   *RSTS*<LF>

Assembly listings ?              *NO*<LF>

Generate BASIC-PLUS ?            *Y *<LF>

BASIC-PLUS RTS name ?            *BASIC*<LF>


Now you must specify the  hardware  con-
figuration  on  which this RSTS/E system
will run.

Clock ?                          *C *<LF>

AC freq ?                        *60*<LF>

KW11P interrupt rate ?           *100*<LF>

KL11,LC11,DL11A,DL11B's ?        *02*<LF>

DL11C, DL11D's ?                 *00*<LF>

DC11's ?                         *02*<LF>
```

```
DP0: disabled - no RP: controller
DP1: disabled - no RP: controller
DB0: disabled - no RB: controller
DB1: disabled - no RB: controller
MM0: disabled - no TU: controller
MM1: disabled - no TU: controller

11 devices disabled

?Can't find file or account
.MOUNT DK0:ORSPAE/RO

.R DK0:CREATE.SAV
```

Sect. 4.1
Step 12

Sect. 4.1
Step 13

```
^C
HELLO 1/2
Password:
1 other user is logged in under this account

.
.ASSIGN DK0: IN

.R IN:PIP.SAV
*LOGIN.SAV<232>/R
**.*<232>=IN:$LOGOUT.SAV
**.*<104>=IN:$PIP.SAV,$UTILTY.SAV/N
**.*<104>=IN:$MACRO.SAV,$CREF.SAV,$LINK.SAV/N
**.*<104>=IN:$SILUS.SAV,$HOOK.SAV,$SYSGEN.SAV/N
**.*=IN:$SYSBAT.SAV,$ERR.STB/N
*^C

.DEASSIGN IN

.DISMOUNT DK0:

.R LOGOUT
Confirm: Y
Saved all disk files; 270 blocks in use
Job 2 User 1,2 logged off KB1 at 11-Nov-76 09:12 PM
1 other user still logged in under this account
System RSTS V06B-02 *TIME SHARING*
Run time was 1 second
Elapsed time was 0 minutes
Good evening
```

```
Run Time System? RT11

Error message file? ERR

Installation name? *TIME SHARING*

  Memory allocation table:

    0K: 00000000 - 00107777 (  18K) : EXEC
   18K: 00110000 - 00127777 (   4K) : RTS (RT11)
   22K: 00130000 - 00577777 (  74K) : USER
   96K: 00600000 - End              : NXM


  Table suboption? LF

You currently have crash dump disabled.

Crash dump? Y

Mastape labelling default (none)? DOS


Option: SET

  SET suboption? LP
  Type (NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB)? LF
  Width (80)? 132
  Lower case (no)? LF

  SET suboption? EXIT


Option: START

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes? LF

Any memory allocation changes? LF

You currently have crash dump enabled.

Crash dump? LF

11-Nov-76? LF
21:11? LF
DF0: disabled - no RF: controller
DS0: disabled - no RS: controller
DS1: disabled - no RS: controller
DM0: disabled - no RM: controller
DM1: disabled - no RM: controller
```

Sect. 3.9
Step 10

Sect. 3.10
Step 11

```
  Size? 24

  Base? LF

Other files? LF

REFRESH suboption? LIST

File                          File                Current   Minimum    Start
Name        Required?  Class Flags Status         Size      Size       LBN

System files:

SWAP   .SYS   YES    NOD CTG     OK          224         64         429
SWAP0  .SYS    NO                OK
SWAP1  .SYS    NO                OK
SWAP3  .SYS    NO                OK
OVR    .SYS    NO                OK                    43
ERR    .SYS    NO                OK                     8
BUFF   .SYS   YES    NOD CTG     OK            6         6         653
CRASH  .SYS    NO    NOD CTG     OK           24        24         659

Others:

BADB   .SYS                NOD                 0
SATT   .SYS           NOD CTG                  1                    5
INIT   .SYS           NOD CTG                210
ERR    .ERR           NOD CTG                  8                  223
ROLLIN.SAV                CTG                 18
SYSGEN.SIL           NOD CTG                159
RT11   .RTS           NOD CTG                 20                  409


REFRESH suboption? EXIT


Option: DEFAULT
                                                    Sect. 3.8
No defaults are currently set                       Step 9

You currently have: JOB MAX = 2, SWAP MAX = 8K.

JOB MAX or SWAP MAX changes? Y

  New JOB MAX? LF

  New SWAP MAX? 28

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes? LF
```

```
REFRESH suboption? LIST

File                          File          Current  Minimum    Start
Name       Required?  Flags Status          Size     Size       LBN

System files:

SWAP   .SYS    YES              CRE                    64
SWAP0  .SYS    NO               OK
SWAP1  .SYS    NO               OK
SWAP3  .SYS    NO               OK
OVR    .SYS    NO               OK                     43
ERR    .SYS    NO               OK                      8
BUFF   .SYS    YES              CRE                     6
CRASH  .SYS    NO               OK                     24

Others:

BADB   .SYS                NOD                      0
SATT   .SYS           NOD  CTG                      1                5
INIT   .SYS           NOD  CTG                    210
ERR    .ERR           NOD  CTG                      8              223
ROLLIN.SAV                CTG                     18
SYSGEN.SIL            NOD  CTG                    159
RT11   .RTS           NOD  CTG                     20              409


REFRESH suboption? CHANGE

SWAP.SYS changes? Y

  Size? 224

  Base? LF

SWAP0.SYS changes? LF

SWAP1.SYS changes? LF

SWAP3.SYS changes? LF

OVR.SYS changes? LF

ERR.SYS changes? LF

BUFF.SYS changes? Y

  Size? 6

  Base? LF

CRASH.SYS changes? Y
```

```
Option: COPY                                        Sect. 3.3
                                                    Step 4
11-Nov-76? LF
21:03? LF

To which disk? DK
Unit? 1


RSTS V06B (DK1)


Option: HARDWR
                                                    Sect. 3.5
  HARDWR suboption? LIST                            Step 6

  Name   Address  Vector   Comments
  TT:     177560    060
  RK:     177400    220    RK05F units: none
  TM:     172520    224
  TC:     177340    214
  PR0:    177550    070
  PP0:    177554    074
  LP0:    177514    200
  KL0:    176500    320
  DE0:    175610    330
  DC0:    174000    300
  DC1:    174010    310
  KG0:    170700
  DH0:    160020    340
  DU0:    160060    350

  HARDWR suboption? EXIT


Option: INSTALL
                                                    Sect. 3.6
  SIL? SYSGEN                                       Step 7


Option: REFRESH                                     Sect. 3.7
                                                    Step 8
11-Nov-76? LF
21:05? LF

Disk? LF

Clean? LF
```

G.2 RK05 DISTRIBUTION AND RK05 SYSTEM DISK

Chap. 2
Step 1

```
RSTS V06B (DK0)
```

Sect. 3.2
Step 2

```
Option: DSKINT

DD-MMM-YY? 11-NOV-76
00:01? 8:50 PM

Disk? DK
Unit? 1
Pack ID? SYSPAK
Pack cluster size? 2
SATT.SYS base?(LF)
MFD password? SYSPAK
MFD cluster size? 4
PUB, PRI, or SYS? SYS
Library password? LIB
Library UFD cluster size? 4
Date last modified? NO
Format? N
Patterns? 3
Proceed (Y or N)? Y
Pattern # 3
Pattern # 2
Pattern # 1
```

Sect. 3.2
Step 3

```
Option: DSKINT

11-Nov-76?(LF)
20:57?(LF)

Disk? DK
Unit? 1
Pack ID? SYSGEN
Pack cluster size? 2
SATT.SYS base?(LF)
MFD password? SYSGEN
MFD cluster size? 4
PUB, PRI, or SYS? SYS
Library password? LIB
Library UFD cluster size? 4
Date last modified? NO
Format? Y
Patterns? 4
Proceed (Y or N)? Y
Starting format pass
End format pass
Pattern # 4
Pattern # 3
Pattern # 2
Pattern # 1
```

```
Ready

COMPILE SY :@BACFRM

Ready

OLD MM1:$BACPRM

Ready

COMPILE SY :@BACPRM

Ready

RUN SY :@BACPRM
BACPRM  V06B-03 RSTS V06B-02 *Time Sharing*

Ready

RUN $PIP
PIP     V06B-03 RSTS V06B-02 *Time Sharing*
#SY :@PIP    .TXT<40>=MM1:$PIPEXT.TXT/FA
#SY :@RUNOFF.RNO<40>=MM1:$RUNOFF.RNO/FA
#SY :@BACKUP.HLP<40>=MM1:$BACKUP.HLP/CO
#=SY :@VT5DPY.BAC<232>/RE
#=SY :@VT50PY.BAC<232>/RE
#=SY :@QUE    .BAC<232>/RE
#=SY :@BACKUP.BAC<232>/RE
#=SY :@BACLST.BAC<232>/RE
#=SY :@BACCON.BAC<232>/RE
#=SY :@BACDIR.BAC<232>/RE
#=SY :@BACMNT.BAC<232>/RE
#=SY :@BACLAB.BAC<232>/RE
#=SY :@BACDSK.BAC<232>/RE
#=SY :@BACKTO.BAC<232>/RE
#=SY :@BACCOM.BAC<232>/RE
#=SY :@BACDMP.BAC<232>/RE
#=SY :@BACDEL.BAC<232>/RE
#=SY :@BACLOD.BAC<232>/RE
#=SY :@BACFRM.BAC<232>/RE
#^C

Ready

HELLO

RSTS V06B-02 *Time Sharing*  Job 2  [1,2]  KB0  09-Nov-76  11:58 PM
Job 1 is detached under this account
Job number to attach to?  1
Attaching to Job 1

BUILD COMPLETE

Ready
```

```
Ready
OLD MM1:$BACKTO
Ready
COMPILE SY :@BACKTO
Ready
OLD MM1:$BACCOM
Ready
COMPILE SY :@BACCOM
Ready
OLD MM1:$BACDMP
Ready
COMPILE SY :@BACDMP
Ready
OLD MM1:$BACDEL
Ready
COMPILE SY :@BACDEL
Ready
OLD MM1:$BACLOD
Ready
COMPILE SY :@BACLOD
Ready
OLD MM1:$BACENT
Ready
COMPILE SY :@BACENT
Ready
OLD MM1:$BACFRM
```

```
Ready
COMPILE SY :@BACKUP
Ready
OLD MM1:$BACLST
Ready
COMPILE SY :@BACLST
Ready
OLD MM1:$BACCON
Ready
COMPILE SY :@BACCON
Ready
OLD MM1:$BACDIR
Ready
COMPILE SY :@BACDIR
Ready
OLD MM1:$BACMNT
Ready
COMPILE SY :@BACMNT
Ready
OLD MM1:$BACLAB
Ready
COMPILE SY :@BACLAB
Ready
OLD MM1:$BACDSK
Ready
COMPILE SY :@BACDSK
```

```
Ready

COMPILE SY :@SPLRUN

Ready

OLD MM1:$BATDCD

Ready

COMPILE SY :@BATDCD

Ready

RUN SY :@BATDCD
BATDCD  V06B-03 RSTS V06B-02 *Time Sharing*

Ready

OLD MM1:$BATCH

Ready

COMPILE SY :@BATCH

Ready

OLD MM1:$BATIDL

Ready

COMPILE SY :@BATIDL

Ready

OLD MM1:$BATDEC

Ready

COMPILE SY :@BATDEC

Ready

OLD MM1:$BATRUN

Ready

COMPILE SY :@BATRUN

Ready

OLD MM1:$BACKUP
```

```
Ready
COMPILE SY :@QUMRUN
Ready
OLD MM1:$OPSER
Ready
COMPILE SY :@OPSER
Ready
OLD MM1:$OPSRUN
Ready
COMPILE SY :@OPSRUN
Ready
OLD MM1:$CHARS
Ready
COMPILE SY :@CHARS
Ready
RUN SY :@CHARS
Ready
OLD MM1:$SPOOL
Ready
COMPILE SY :@SPOOL
Ready
OLD MM1:$SPLIDL
Ready
COMPILE SY :@SPLIDL
Ready
OLD MM1:$SPLRUN
```

```
Ready
COMPILE SY :@VT5DPY
Ready
OLD MM1:$DISPLY
Ready
APPEND MM1:$VT50  .DPY
Ready
COMPILE SY :@VT50PY
Ready
OLD MM1:$RUNOFF
Ready
COMPILE SY :@RUNOFF<40>
Ready
OLD MM1:$FLINT
Ready
COMPILE SY :@FLINT<40>
Ready
OLD MM1:$QUE
Ready
COMPILE SY :@QUE
Ready
OLD MM1:$QUEMAN
Ready
COMPILE SY :@QUEMAN
Ready
OLD MM1:$QUMRUN
```

```
Ready

HELLO

RSTS V06B-02 *Time Sharing*  Job 2  [1,2]  KB0  09-Nov-76  11:34 PM
Job 1 is detached under this account
Job number to attach to?  1
Attaching to Job 1

BUILD COMPLETE

Ready

RUN$BUILD
BUILD   V06B-03 RSTS V06B-02 *Time Sharing*
SYSTEM BUILD? NO
SOURCE INPUT DEVICE? MM1:
LIBRARY OUTPUT DEVICE <SY:>? LF
LIBRARY ACCOUNT <[1,2]>? LF
CONTROL FILE IS? S\S\$SPLER.CTL
^C
HELLO

RSTS V06B-02 *Time Sharing*  Job 2  KB0  09-Nov-76  11:40 PM
# 1 / 2
Password:
Job 1 is detached under this account
Job number to attach to?
1 other user is logged in under this account


Ready

ASSIGN [1,2]

Ready


!********** SPLER.CTL - LARGE PROGRAM BUILD

OLD MM1:$PIPEXT

Ready

COMPILE SY :@PIP<40>

Ready

OLD MM1:$DISPLY

Ready

APPEND MM1:$VT05  .DPY
```

Sect. 6.2.1.2
Step 28

```
Ready

OLD MM1:$INUSE

Ready

COMPILE SY :@INUSE

Ready

RUN SY0:@PIP
PIP     V06B-03  - RSTS V06B-02 *Time Sharing*
#SY0:@NOTICE.TXT<40>=MM1:$NOTICE.TXT/FA
#SY0:@HELP  .TXT<40>=MM1:$HELP  .TXT/FA
#SY0:@START .CTL    =MM1:$START .CTL/FA
#SY0:@TTY   .CMD    =MM1:$TTY   .CMD/FA
#SY0:@SPOOL .CMD    =MM1:$SPOOL .CMD/FA
#SY0:@RTS   .CMD    =MM1:$RTS   .CMD/FA
#SY0:@CCL   .CMD    =MM1:$CCL   .CMD/FA
#SY0:@CRASH .CTL    =MM1:$CRASH .CTL/FA
#SY0:@ANALYS.CMD    =MM1:$ANALYS.CMD/FA
#SY0:@UTILTY.TXT    =MM1:$UTILTY.TXT/FA
#SY0:@ERRDAT.FIL    =MM1:$ERRDAT.FIL/CO
#SY0:@PIP   .TXT<40>=MM1:$PIP   .TXT/FA
#SY0:@DIRECT.HLP<40>=MM1:$DIRECT.HLP/FA
#SY0:@TTYSET.SPD    =MM1:$TTYSET.SPD/FA
#SY :@ERRDIS.HLP    =MM1:$ERRDIS.HLP/FA
#SY :@ACCT  .SYS    =MM1:$ACCT  .SYS/FA
#SY :@COPY  .TXT<40>=MM1:$COPY  .TXT/FA
#=SY0:@LOGIN .BAC<232>/RE
#=SY0:@LOGOUT.BAC<232>/RE
#=SY0:@DIRECT.BAC<232>/RE
#=SY0:@TTYSET.BAC<232>/RE
#=SY0:@SYSTAT.BAC<232>/RE
#=SY :@UMOUNT.BAC<232>/RE
#=SY :@QUOLST.BAC<232>/RE
#=SY :@GRIPE .BAC<232>/RE
#=SY :@TALK  .BAC<232>/RE
#=SY :@PLEASE.BAC<232>/RE
#=SY :@INUSE .BAC<232>/RE
#^C


Ready

RUN SY0:@UTILTY
UTILTY  V06B-03 RSTS V06B-02 *Time Sharing*
#LOGINS
#EXIT

Ready

^C
```

```
Ready
COMPILE SY :@COPY<40>
Ready
OLD MM1:$FILCOM
Ready
COMPILE SY :@FILCOM<40>
Ready
OLD MM1:$QUOLST
Ready
COMPILE SY :@QUOLST
Ready
OLD MM1:$MONEY
Ready
COMPILE SY :@MONEY<40>
Ready
OLD MM1:$GRIPE
Ready
COMPILE SY :@GRIPE
Ready
OLD MM1:$TALK
Ready
COMPILE SY :@TALK
Ready
OLD MM1:$PLEASE
Ready
COMPILE SY :@PLEASE
```

```
Ready
OLD MM1:$PRIOR
Ready
COMPILE SY :@PRIOR
Ready
OLD MM1:$ODT
Ready
COMPILE SY :@ODT
Ready
OLD MM1:$REACT
Ready
COMPILE SY :@REACT
Ready
OLD MM1:$REORDR
Ready
COMPILE SY :@REORDR
Ready
OLD MM1:$DSKINT
Ready
COMPILE SY :@DSKINT
Ready
OLD MM1:$UMOUNT
Ready
COMPILE SY :@UMOUNT
Ready
OLD MM1:$COPY
```

```
OLD MM1:$EDITCH

Ready

COMPILE SY0:@EDITCH<40>

Ready

OLD MM1:$BUILD

Ready

COMPILE SY0:@BUILD

Ready

OLD MM1:$ERRDIS

Ready

COMPILE SY :@ERRDIS

Ready

OLD MM1:$ERRDET

Ready

COMPILE SY :@ERRDET

Ready

OLD MM1:$ANALYS

Ready

COMPILE SY :@ANALYS

Ready

OLD MM1:$ANALY1

Ready

COMPILE SY :@ANALY1

Ready

OLD MM1:$SYSCAT

Ready

COMPILE SY :@SYSCAT
```

```
Ready
COMPILE SY0:@ERRINT
Ready
OLD MM1:$ERRCPY
Ready
COMPILE SY0:@ERRCPY
Ready
OLD MM1:$PIP
Ready
COMPILE SY0:@PIP<40>
Ready
OLD MM1:$DIRECT
Ready
COMPILE SY0:@DIRECT
Ready
OLD MM1:$TTYSET
Ready
COMPILE SY0:@TTYSET
Ready
OLD MM1:$SYSTAT
Ready
COMPILE SY0:@SYSTAT
Ready
OLD MM1:$EDIT
Ready
COMPILE SY0:@EDIT<40>
Ready
```

```
Job number to attach to?
1 other user is logged in under this account

Ready

ASSIGN [1,2]

Ready


!********** BUILD.CTL - STANDARD LIBRARY PROGRAMS

OLD MM1:$LOGOUT

Ready

COMPILE SY0:@LOGOUT

Ready

OLD MM1:$UTILTY

Ready

COMPILE SY0:@UTILTY

Ready

OLD MM1:$UTILT1

Ready

COMPILE SY0:@UTILT1

Ready

OLD MM1:$INIT

Ready

COMPILE SY0:@INIT

Ready

OLD MM1:$SHUTUP

Ready

COMPILE SY0:@SHUTUP

Ready

OLD MM1:$ERRINT
```

```
SET suboption? EXIT

Option: START

You currently have: JOB MAX = 40, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes? (LF)

Any memory allocation changes? (LF)

You currently have crash dump enabled.

Crash dump? (LF)

09-Nov-76? (LF)
23:21? (LF)
?Can't find file or account
?Program lost-Sorry

Ready

RUN MM1:$BUILD
BUILD   V06B-03 RSTS V06B-02 *Time Sharing*
SYSTEM BUILD? YES
TARGET SYSTEM DEVICE <SY0:>? (LF)
SOURCE INPUT DEVICE? MM1:
LIBRARY OUTPUT DEVICE <SY:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
ASSIGN [1,2]
OLD MM1:$LOGIN
COMPILE SY0:@LOGIN
CHAIN 'MM1:$BUILD' 9200

Ready


Ready


Ready


Ready


Ready

^C
HELLO

RSTS V06B-02 *Time Sharing*  Job 2  KB0  09-Nov-76  11:24 PM
# 1 / 2
Password:
Job 1 is detached under this account
```

Sect. 5.7
Step 25

Sect. 6.2.1.1
Steps 26, 27

```
  New SWAP MAX? 28

You currently have: JOB MAX = 40, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes? (LF)

Run Time System? BASIC

Error message file? ERR

Installation name? *Time Sharing*

  Memory allocation table:

    0K: 00000000 - 00163777 (  29K) : EXEC
   29K: 00164000 - 00257777 (  15K) : RTS (BASIC)
   44K: 00260000 - 02177777 ( 244K) : USER
  288K: 02200000 - End              : NXM


  Table suboption? XBUF

    Extended buffer address range is? 44K-75K

  Table suboption? LIST

  Memory allocation table:

    0K: 00000000 - 00163777 (  29K) : EXEC
   29K: 00164000 - 00257777 (  15K) : RTS (BASIC)
   44K: 00260000 - 00457777 (  32K) : XBUF
   76K: 00460000 - 02177777 ( 212K) : USER
  288K: 02200000 - End              : NXM


  Table suboption? EXIT

You currently have crash dump disabled.

Crash dump? YES

Mastape labelling default (none)? DOS


Option: SET

  SET suboption? LP
  Type (NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB)? LP
  Width (80)? 132
  Lower case (no)? YES
```

Sect. 5.6
Step 24

```
Others:

   BADB  .SYS              NOD          0
   SATT  .SYS          NOD CTG          3          20
   INIT  .SYS          NOD CTG        210
   ERR   .ERR              CTG          8         276
   ROLLIN.SAV              CTG         18
   SYSGEN.SIL              CTG        159
   RT11  .RTS              CTG         20         484
   RSTS  .SIL              NOD        226
   BASIC .RTS              CTG         68        5076

   REFRESH suboption? CHANGE

   SWAP.SYS changes? YES

     Delete? N

     Size? 560

     Base? 80000

   SWAP0.SYS changes? LF

   SWAP1.SYS changes? LF

   SWAP3.SYS changes? LF

   OVR.SYS changes? LF

   ERR.SYS changes? LF

   BUFF.SYS changes? LF

   CRASH.SYS changes? LF

   Other files? LF

   REFRESH suboption? EXIT

Option: DEFAULT                                  Sect. 5.5
                                                 Step 23
No defaults are currently set

You currently have: JOB MAX = 40, SWAP MAX = 8K.

JOB MAX or SWAP MAX changes? YES

  New JOB MAX? LF
```

```
  CRASH.SYS changes? LF

  Other files? LF

  REFRESH suboption? LIST

  File                        File                Current  Minimum    Start
  Name        Required?       Flags  Status       Size     Size       LBN

System files:

  SWAP  .SYS    NO                    OK
  SWAP0 .SYS    NO    NOD CTG         OK          1904                  9
  SWAP1 .SYS    NO                    OK
  SWAP3 .SYS    NO                    OK
  OVR   .SYS    NO    NOD CTG         OK            43        43     1913
  ERR   .SYS    NO    NOD CTG         OK             8         8     1956
  BUFF  .SYS    NO                    OK
  CRASH .SYS    NO                    OK

Others:

  BADB  .SYS          NOD             0
  SATT  .SYS        NOD CTG           1                             2


  REFRESH suboption? ^Z

Disk? LF

Clean? LF

  REFRESH suboption? LIST

  File                        File                Current  Minimum    Start
  Name        Required?       Flags  Status       Size     Size       LBN

System files:

  SWAP  .SYS    YES   NOD CTG         OK           224        64    80004
  SWAP0 .SYS    NO                    OK
  SWAP1 .SYS    NO                    OK
  SWAP3 .SYS    NO                    OK
  OVR   .SYS    NO                    OK                       43
  ERR   .SYS    NO                    OK                        8
  BUFF  .SYS    YES   NOD CTG         OK            12        12    79012
  CRASH .SYS    NO    NOD CTG         OK            80        48      516
```

```
Disk is being cleaned - wait ...

  REFRESH suboption? LIST

  File                        File          Current  Minimum    Start
  Name       Required?  Class Status          Size     Size       LBN

System files:

  SWAP   .SYS     NO              OK
  SWAP0  .SYS     NO              OK
  SWAP1  .SYS     NO              OK
  SWAP3  .SYS     NO              OK
  OVR    .SYS     NO              OK                    43
  ERR    .SYS     NO              OK                     8
  BUFF   .SYS     NO              OK
  CRASH  .SYS     NO              OK

Others:

  BADB   .SYS              NOD                 0
  SATT   .SYS          NOD CTG                 1                    2

  REFRESH suboption? CHANGE

  SWAP.SYS changes? LF

  SWAP0.SYS changes? YES

    Size? 1904

    Base? LF

  SWAP1.SYS changes? LF

  SWAP3.SYS changes? LF

  OVR.SYS changes? YES

    Size? 43

    Base? LF

  ERR.SYS changes? YES

    Size? 8

    Base? LF

  BUFF.SYS changes? LF
```

```
Option: DSKINT

09-Nov-76? LF
23:07? LF

Disk? DS
Unit? 0
Pack ID? SWPFIL
Pack cluster size? 1
SATT.SYS base? LF
MFD password? SWPMFD
MFD cluster size? 1
PUB, PRI, or SYS? PUB
Create library account? N
Date last modified? N
Patterns? 2
Proceed (Y or N)? Y
Pattern # 2
Pattern # 1
```

Sect. 3.2

```
Option: DSKINT

09-Nov-76? LF
23:08? LF

Disk? DS
Unit? 1
Pack ID? SWAPNF
Pack cluster size? 1
SATT.SYS base? LF
MFD password? SWPMFD
MFD cluster size? 1
PUB, PRI, or SYS? PUB
Create library account? N
Date last modified? N
Patterns? 2
Proceed (Y or N)? Y
Pattern # 2
Pattern # 1
```

Sect. 3.2

```
Option: REFRESH

09-Nov-76? LF
23:09? LF

Disk? DS
Unit? 0

Clean? Y
```

Sect. 5.4
Step 22

```
*^C

.R PIP.SAV
*PRT:*.*=BASIC.MAP
*^C

.R SILUS.SAV
*BASIC.RTS=BASIC
*^C

.DEASSIGN  PRT

.DEASSIGN  LP0:

.R PIP.SAV
*SY0:[0,1]*.*/MODE:16.=BASIC.RTS
*BASIC.RTS/D
*^C

.R LOGOUT
Confirm: Y
Saved all disk files; 3888 blocks in use
Job 2 User 1,2 logged off KB1 at 09-Nov-76 11:01 PM
1 other user still logged in under this account
System RSTS V06B-02 Syssen System
Run time was 3 minutes, 3.2 seconds
Elapsed time was 42 minutes
Good evening


Batch job completed.

.RUT\TU\ UTILTY                                    Sect. 4.4
*NO LOGINS                                         Step 16
*SHUTUP


RSTS V06B-02 Syssen System (DB0)

Option: INSTALL                                    Sect. 5.2
                                                   Step 20
  SIL? RSTS
```

```
   .R PIP.SAV
   *PRT:*.*=RSTS.MAP,EMT.MAP,FIP.MAP,OVR.MAP
   *^C

   .R SILUS.SAV
   *SY0:[0,1]RSTS.SIL=RSTS,EMT/M,FIP/M/C
   *OVR/M/C
   *ORSPAE:ODT,DEFALT
   *^C

   .R PIP.SAV
   *BASIC.SAV,BASIC.STB/D
   ?Can't find file or account - file BASIC .SAV - continuing
   ?Can't find file or account - file BASIC .STB - continuing

MOUNT DEC-11-ORSPA-E-MC9 ON A MAGTAPE DRIVE

WITH NO "WRITE RING" AND SET TO "ON LINE"

Mount MM:"ORSPAE"-write locked
Unit ? 1
   *^C

   .ASSIGN  MM1:

   .ASSIGN  MM1: IN

   .R PIP.SAV
   **.*=IN:$RTS.OBJ
   **.*=IN:$*.OBJ/N
   *^C


Dismount MM1:
   .DEASSIGN  IN

   .DEASSIGN  MM1:

   .R LINK.SAV
   *BASIC/Z,BASIC/A,BASIC=ORSPAE:RTS,DK:$ERR.STB/X/H:#177776/U:#4000/C
   *ORSPAE:MA2F/C
   *ORSPAE:XL2F/C
   *ORSPAE:XT2F/C
   *ORSPAE:IO/C
   *ORSPAE:PU/C
   *ORSPAE:MX/C
   *ORSPAE:SN/C
   *ORSPAE:TI/C
   *ORSPAE:DA/C
   *ORSPAE:VE
   ROUND SECTION:
   ? PA
```

```
.R PIP.SAV
*PRT:*.*=TBL.LST,TTDVR.LST
*^C

.R LINK.SAV
*RSTS/Z,RSTS/A,RSTS=TBL,$ERR.STB/X/B:0/U:#1000/I/C
*ORSPAE:RSTS/C
*TTDVR
ROUND SECTION:
? MORBUF
LIBRARY SEARCH:
? BUF
? DKSEEK
? DBSEEK
?


*^C

.R LINK.SAV
*EMT/Z,EMT/A,EMT=ORSPAE:EMT,DK:RSTS.STB/X/B:#117000/U:#1000/C
*ORSPAE:RSTS
ROUND SECTION:
? EMTPAT


*^C

.R LINK.SAV
*FIP/Z,FIP/A,FIP=ORSPAE:FIP,DK:RSTS.STB/X/B:#117000/U:#1000/I/C
*ORSPAE:RSTS
ROUND SECTION:
? FIPPAT
LIBRARY SEARCH:
? OPN
? UUO
? SND
? LIN
? DLN
? DIR
?


*^C

.R LINK.SAV
*OVR/Z,OVR/A,OVR=ORSPAE:OVR,DK:FIP.STB,ORSPAE:RSTS/X/B:#1000


*^C
```

```
.ASSIGN  SY:  ORSPAE


Specify LP unit
Unit ? 0
  .ASSIGN  LP0:

  .ASSIGN  LP0: PRT

  .R PIP.SAV
  *TBL.OBJ,TTDVR.OBJ/D
  ?Can't find file or account - file TBL    .OBJ - continuing
  ?Can't find file or account - file TTDVR  .OBJ - continuing
  *TBL.LST,TTDVR.LST/D
  ?Can't find file or account - file TBL    .LST - continuing
  ?Can't find file or account - file TTDVR  .LST - continuing
  *RSTS.SAV,EMT.SAV,FIP.SAV,OVR.SAV,NSP.SAV,RJ2780.SAV/D
  ?Can't find file or account - file RSTS   .SAV - continuing
  ?Can't find file or account - file EMT    .SAV - continuing
  ?Can't find file or account - file FIP    .SAV - continuing
  ?Can't find file or account - file OVR    .SAV - continuing
  ?Can't find file or account - file NSP    .SAV - continuing
  ?Can't find file or account - file RJ2780.SAV - continuing
  *RSTS.MAP,EMT.MAP,FIP.MAP,OVR.MAP,NSP.MAP,RJ2780.MAP/D
  ?Can't find file or account - file RSTS   .MAP - continuing
  ?Can't find file or account - file EMT    .MAP - continuing
  ?Can't find file or account - file FIP    .MAP - continuing
  ?Can't find file or account - file OVR    .MAP - continuing
  ?Can't find file or account - file NSP    .MAP - continuing
  ?Can't find file or account - file RJ2780.MAP - continuing
  *RSTS.STB,EMT.STB,FIP.STB,OVR.STB,NSP.STB,RJ2780.STB/D
  ?Can't find file or account - file RSTS   .STB - continuing
  ?Can't find file or account - file EMT    .STB - continuing
  ?Can't find file or account - file FIP    .STB - continuing
  ?Can't find file or account - file OVR    .STB - continuing
  ?Can't find file or account - file NSP    .STB - continuing
  ?Can't find file or account - file RJ2780.STB - continuing
  *^C

  .R MACRO.SAV
  *TBL,TBL/C=ORSPAE:COMMON,KERNEL,DK:CONFIG,ORSPAE:CHECK,TBL
  ERRORS DETECTED: 0
  FREE CORE: 10210. WORDS

  *^C

  .R MACRO.SAV
  *TTDVR,TTDVR/C=ORSPAE:COMMON,KERNEL,DK:CONFIG,ORSPAE:CHECK,KBDEF,TTDVR
  ERRORS DETECTED: 0
  FREE CORE: 8763. WORDS

  *^C
```

```
Strins arithmetic ?                    #NO# (LF)

The system seneration  dialos is finish-
ed. If you have any special requirements
which reauire editins the senerated file
CONFIG.MAC(system confisuration file) or
SYSGEN.CTL(batch control file)  you  may
do it now.  When  ready tupe "R SYSBAT".

.R SYSBAT
```

Sect. 4.3
Step 15

```
SYSGEN  batch  processins  has  started.
If any problems develop durins the batch
process  it  may  be aborted  by  typins
"Control/C". To restart type "R SYSBAT".
```

```
  ^C
  HELLO 1/2
  Password:
  1 other user is lossed in under this account

  .

MOUNT DEC-11-ORSPA-E-MC9 ON A MAGTAPE DRIVE

WITH NO "WRITE RING" AND SET TO "ON LINE"

Mount MM:"ORSPAE"-write locked
Unit ? 1
  .ASSIGN  MM1:

  .ASSIGN  MM1: IN

  .R PIP.SAV
  **.*<40>=IN:$COMMON.MAC
  **.*=IN:$*.MAC/H/N
  **.*=IN:$*.OBJ/H/N
  **.*=IN:$*.SAV/H/N
  **.*=IN:$*.STB/H/N
  *^C

Dismount MM1:
  .DEASSIGN  IN

  .DEASSIGN  MM1:
```

```
math packages also include the scaled
arithmetic feature.  Would this instal-
lation prefer to use 2 or 4 word math.

Math precision ?                    #02# (LF)

It is possible to save space in the BA-
SIC-PLUS system by omitting the extended
functions SIN, COS, SQR, LOG, etc., if
they are not needed.  Does this instal-
lation need to compute these functions
(YES or NO).

Functions ?                         #Y # (LF)

The RSTS/E system normally reports the
time of day as AM/PM (e.g. 9:13 PM).  It
is possible to have 24-hour time (e.g.
21:13) reported instead.  Do you want
"AM/PM" or "24-hour" time reported.

Time format ?                       #AM# (LF)

The RSTS/E system normally prints the
month as three alphabetic characters
(e.g. 04-Jul-76).If desired, the numeric
value of the month can be printed
instead (e.g. 76.07.04).  Do you want an
alphabetic month (YES or NO).

Alphabetic month ?                  #Y # (LF)

Special output formatting can be done
using the "PRINT USING" statement.
Would this installation like to have
this optional feature (YES or NO).

Print using ?                       #Y # (LF)

BASIC-PLUS permits the user to operate
on an entire matrix using just a single
statement.  These statements are the
"MAT" statements.  Would this installa-
tion like to have this optional feature.

Matrices ?                          #NO#    Y

An optional feature of BASIC-PLUS allows
arithmetic operations to be performed on
numbers represented by strings.  This
feature can be used to obtain greater
accuracy in arithmetic operations.  Do
you want string arithmetic (YES or NO).
```

```
may want send/receive resident.  Please
answer YES or NO.

Resident send/receive ?          #NO#     Y

The routines to implement the simple SYS
calls are normally non-resident. Overall
system performance can be improved by
making this code resident. Do you want
the simple SYS call code resident (YES
or NO).

Resident simple SYS calls ?      #NO#     Y

Non-resident code is used to delete or
rename a file. If you want the file
delete/rename code to be resident type
"YES"; otherwise type "NO".

Resident file delete/rename ?    #NO#     Y

Non-resident code is used to do logins,
attaches, and assign attributes. If you
want the login, attach, and attribute
code resident, type "YES", else answer
"NO".

Res. login/attach/attribute ?    #NO#     Y

Non-resident code is used to list disk
directories (CATALOG command) and do
file lookups. If you want the directory
lister and file lookup code resident,
type "YES", otherwise answer "NO".

Resident catalog/lookup ?        #NO#     Y


The following questions deal with the
BASIC-PLUS run-time system

Will this software run on a computer
with a floating point processor (YES
or NO).

FPP ?                                *Y *(LF)

Floating point numbers are represented
internally as two 16-bit words, giving
seven significant digits. It is possible
to maintain 17 significant digits by us-
ing 4 words per number.  The four word
```

parameter blocks, etc. Storage may be allocated for 30 to 999 small buffers. The recommended number is at least 10 for each possible job. How many small buffers would this installation like to have (30 to 999).

Small buffers ? #440# LF

Logical names can be assigned to devices on a system wide basis. The assignment table consists of five words for each allowed assignment. Please enter the maximum number of system wide logical assignments that will be in use at any time (0-30).

System wide logicals ? #10# LF

When power is restored after a power failure, RSTS/E can delay the recovery for 1 to 300 seconds (5 minutes). Answer with your delay factor (1 to 300).

Delay factor ? #001# 100

An optional feature of the RSTS/E system allows the file processor (FIP) to use free buffers, or dedicated sections of memory (called the extended buffer pool) to store directory information. This improves the speed of directory processings by not rereading frequently accessed directory information. If you want FIP buffering type YES, otherwise type NO.

FIP buffering ? #Y # LF

If there is sufficient memory available on this system, the most frequently used non-resident disk handling code can be made resident in order to provide better system performance. Should this disk processing be done by resident code (YES or NO).

Resident disk handling ? #Y # LF

The routines which implement the send and receive system function calls are also non-resident. If your applications require inter-job communication, you

Is there a high-speed paper tape reader (YES or NO).

P.T. reader ? *NO* LF

Is there a high-speed paper tape punch (YES or NO).

P.T. punch ? *NO* LF

DECNET/E is a set of modules which implement the network services protocol and user interfaces required for DECNET communication. The DECNET/E software is sold and distributed as a separate package. It is not included in the standard RSTS/E kit. Do you have a DECNET/E kit and wish to include DECNET support in this system (YES or NO).

DECNET network support ? #NO# LF

The RSTS/E 2780 package emulates the operation of the IBM 2780 Model 1 data transmission terminal. The package permits the RSTS/E system to communicate with any IBM system which supports the device, or another RSTS/E 2780 system. The 2780 package is sold and supported by the DEC Communications Group. It is not included in the standard RSTS/E kit. Do you have the 2780 package and wish to include it in this system (YES or NO).

2780 support ? #NO# LF

The remaining questions deal with the capacity and features of this RSTS/E system provided at the system manager's option.

With sufficient hardware RSTS/E can handle up to 63 simultaneous jobs. What is the maximum number of jobs (JOBMAX) to be used at this installation (1 to 63).

Maximum Jobs ? #10# 40

Small buffers are 16 word blocks in monitor storage that are dynamically allocated as input and output buffers, file

```
how many TU16 and TU45 drives are on
this system (1 to 8).

TU16's ?                              #08#    2

The TM11 magtape controller can support
up to eight TU10 or TS03 magtape drives.
Please enter the number of TU10 and TS03
drives on this system (0 to 8).

TU10's ?                              *00*(LF)

The TC11 DECtape controller can control
up to 8 single drives.  If this system
has no DECtape at all, answer 0; other-
wise, how many single DECtape drives,
not TU56's, are there (1 to 8 - note
that each TU56 dual drive has 2).

DECtapes ?                            #08#    4

The RSTS/E system can have up to eight
line printers of the LP11, LS11, or LV11
type. These printers are referred to by
the device names LP0: through LP7:.  If
there is no line printer, answer 0;
otherwise, enter the number of printers
(1 to 8).

Printers ?                            *01*(LF)

The RX11 floppy disk system consists of
a UNIBUS interface and the RX01 floppy
disk subsystem. The RX01 includes a disk
controller and two floppy disk drives.
RSTS/E supports up to four RX11 systems
for a maximum of eight drives. Please
enter the number of floppy disk drives
attached to this system (0 to 8).

RX01's ?                              *00*(LF)

Does this system have a CR11 punched
card reader or a CM11 marked card reader
(YES or NO).

CR11/CM11 card reader ?               *NO*(LF)

Does this system have a CD11 high-speed
punched card reader (YES or NO).

CD11 card reader ?                    *NO*(LF)
```

How many RK05 drives are there (0 to 8).

RK05's ? #08# 4

By using the overlapped seek driver, you can increase the efficiency of disk I/O at the expense of some memory. Type YES to use the overlapped seek driver. Type NO to use the non-overlapped seek driver.

Overlapped seek ? *Y *(LF)

The RK611 controller is used to control up to eight of the RK06 six million word top loading cartridge disk drives. Enter the number of RK06 drives on this system (0 to 8).

RK06's ? *00*(LF)

The RP11 controller is used to control any combination of up to eight RP02 (10 million word) or RP03 (20 million word) moving-head disk pack drives. Enter the total number of RP02 and RP03 drives on this system (0 to 8).

RP02/RP03's ? *00*(LF)

The RJP04/5/6 disk system consists of an RH11 controller and any combination of up to eight RP04 (44 million word), RP05 (44 million word), or RP06 (88 million word) moving-head disk pack drives. Type the total number of RP04, RP05, and RP06 drives in this configuration (0 to 8).

RP04/RP05/RP06's ? *03*(LF)

Overlapped seek ? *Y *(LF)

The next few questions deal with the peripheral devices attached to this RSTS/E system.

The TJU16 magtape system consists of an RH11 massbus interface, TM02 controller, and from one to eight TU16 or TU45 tape drives. If this system has no TU16 or TU45 magtape units answer 0; otherwise,

```
and a separate job for each is undesir-
able or at least inefficient.  Would you
like to include this feature (YES or NO)

Multi-terminal service ?          *Y *(LF)

Echo control is an optional feature of
the RSTS/E terminal service which allows
any full duplex terminal to function
like a block mode terminal.  This feature
enables a program to define fixed length
input fields and to defer echoing of all
typed characters until they are actually
requested.  It is useful in data entry
applications or wherever the appearance
of terminal output must be precisely
controlled.  Would you like to include
this feature in your system (YES or NO).

Echo control ?                    *Y *(LF)


The next questions deal with the numbers
and kinds of disk units on this system.

The RC11 controller is used to control
up to 4 of the RS64 64K word fixed-head
disks.  If there are none of these units,
answer NO;  otherwise, answer YES.

RC11/RS64's ?                     *NO*(LF)

The RF11 controller is used to control
up to 8 of the RS11 256K word fixed-head
disks.  If this system has none of these
disks, answer NO; otherwise, answer YES.

RF/RS11's ?                       *NO*(LF)

The RJS04/RJS03 disk system consists of
an RH11 device controller and from one
to eight RS03 (256K) or RS04 (512K word)
fixed-head disk drives.  Please enter the
total number of RS03 and RS04 drives on
this system (0 to 8).

RS03/RS04's ?                     *02*(LF)

The RK11 controller is used to control
up to 8 of the RK05 1.2 million word
moving-head cartridge disk drives.  Note
that an RK05F is equivalent to 2 RK05's.
```

this DH11 unit. Enter the number of lines enabled (0 to 16).

```
DH11 unit 00 lines enabled ?     #16#<LF>

DH11 unit 01 lines enabled ?     #16#<LF>
```

Dial-up telephone lines can be connected through an automatic answer dataset to a DH11 multiplexer with a DM11-BB modem controller. Note: all DH11-AD's include a DM11-BB as an integral part of the DH11. If you wish to include support for datasets on DH11's answer YES. Otherwise answer NO.

```
Dataset support for DH11's ?     *Y *<LF>
```

Each DZ11 multiplexer can connect up to 8 terminals to the system. Please enter the total number of DZ11's attached to this system (0 to 16).

```
DZ11's ?                         *00*<LF>
```

Pseudo keyboards permit interactive jobs to be run without tying up a real terminal. They are primarily intended for use by a batch control program which feeds commands to one or more pseudo keyboards dedicated to running background tasks. How many pseudo keyboards would you like to have (0 to 127).

```
Pseudo keyboards ?               #04#     10
```

RSTS/E is capable of supporting IBM 2741 compatible terminals on DL11D, DL11E, and DC11 single line interfaces, or on DH11 or DZ11 multiplexers. If you do not want any 2741 support then answer "NO". Otherwise answer "YES".

```
2741 support ?                   #NO#<LF>
```

An optional feature of the RSTS/E terminal service allows one job to interact with several terminals through special forms of the the record I/O GET and PUT statements. This feature is useful in applications where the same basic function is performed on several terminals

```
The first class includes the KL11, LC11,
DL11A, and DL11B interfaces. Specify the
total number of these single line inter-
faces (1 to 16 - include the console
terminal).

KL11,LC11,DL11A,DL11B's ?          *01*(LF)

The second class of single line inter-
faces used to connect terminals locally
or through leased telephone lines (not
dial-up) includes the DL11C and DL11D
interfaces. How many DL11C's and DL11D's
are on this system (0 to 31).

DL11C, DL11D's ?                   *00*(LF)

There are two kinds of individual inter-
faces for automatic answer datasets used
on the dial-up telephone network. The
first of these is the DC11. How many
DC11-DA lines do you have (0 to 32).

DC11's ?                           *00*(LF)

The second kind of individual line
dial-up interface is the DL11E. How many
DL11E's are on this system (0 to 31).

DL11E's ?                          *00*(LF)

Each DJ11 multiplexer can connect up to
16 terminals to the system. Please enter
the total number of DJ11's attached to
this system (0 to 16).

DJ11's ?                           *00*(LF)

Each DH11 multiplexer can connect up to
16 terminals to the system. Please enter
the total number of DH11's attached to
this system (0 to 16).

DH11's ?                           *02*(LF)

For this DH11 unit, enter the number of
lines which will be used now or in the
forseeable future. A response of 16 will
permit all lines to be used. If the num-
ber of lines enabled (n) is less than 16
RSTS/E will not be confisured for and
will not recognize lines n thru 15 on
```

Now you must specify the hardware configuration on which this RSTS/E system will run.

The RSTS/E system clock can be either a KW11-L line frequency clock or a KW11-P programmable clock. The KW11-P clock has an internal crystal oscillator which can be used as the system time base in areas where the AC power frequency is not accurate. If you have the KW11-L clock, answer "L". For the KW11-P, answer "P" to use the AC line frequency as the time base, or answer "C" to use the crystal oscillator (L, P, or C).

Clock ? $C $ LF

The AC power frequency is normally 60 hertz in the United States, but elsewhere it can be 50 hertz. What is the AC power frequency at which this system will run (50 or 60).

AC freq ? 60 LF

The KW11-P 10KHZ crystal oscillator will be used as the system time base. This frequency is divided in the hardware to provide the desired interrupt rate. For RSTS/E the interrupt rate can be any multiple of 50HZ between 50 and 1000 HZ. The larger multiples provide better time resolution for Job accounting and scheduling purposes at the small expense of additional clock interrupt overhead. Please enter the interrupt rate desired (50,100,150,...,1000).

KW11P interrupt rate ? 100 LF

The next few questions deal with the numbers and types of terminal interfaces on the system.

Serial ASCII terminals connected directly to the computer and those connected through leased private telephone lines (not dial-up) may use either of two classes of single line interfaces (or several multiplexers, discussed later).

```
If there is a line printer available for
use during SYSGEN it may be used to
print the system load maps and,
optionally, to print assembly listings
of the system tables and terminal
service modules. If you have a printer
and want the assembly listings and/or
load maps printed during SYSGEN, answer
"YES". Otherwise answer "NO".

LP for SYSGEN ?                    *Y *(LF)

This program can be used to generate a
monitor and/or a BASIC-PLUS run-time
system. Do you wish to generate a
monitor (YES or NO).

Generate monitor ?                 #Y #(LF)

The monitor Save Image Library (SIL)
will have a name of from 1 to 6 alpha-
numeric characters and an extension of
"SIL". Please specify the name you want.

Monitor name ?                     #RSTS#(LF)

The system generation process includes
the assembly of the system tables and
the terminal service software. It is
possible to have listings of these two
tailored modules printed on the line
printer. Would you like to print these
listings (YES or NO).

Assembly listings ?                #NO#    YES

You have the option of generating the
BASIC-PLUS run-time system in addition
to generating the monitor. Do you want
to generate BASIC-PLUS at this time
(YES or NO).

Generate BASIC-PLUS ?              #Y #(LF)

The BASIC-PLUS Save Image Library (SIL)
will have a name of from 1 to 6 alpha-
numeric characters and an extension of
"RTS". Please specify the name you want.

BASIC-PLUS RTS name ?              #BASIC#(LF)
```

```
The system will automatically supply
answers to all of its prompts.  You have
the option of accepting the answer,
supplying a different answer or
requesting the full printed message.  The
hardware answers will be meaningful only
if you are generating a system for the
computer that you are currently running
on.  If you are generating a system for
this computer type "YES", else type "NO"

Same system ?                          *Y *(LF)

The RSTS/E system is distributed on
DECtape (DT), magtape, RK05 (DK) and
RK06 (DM) cartridge disks, or may have
been already transferred to the system
disk (SY).  In the case of magtape, a
distinction must be made between two
classes of drives.  TS03 and TU10 drives
are referenced by the device name "MT".
TU16 and TU45 drives use the name "MM".
Enter the type of distribution medium
for this system generation (DT,MT,MM,DK,
DM,SY).

Distribution medium ?                  *??*    MM

The generated system can be written onto
the current system disk (SY), another
disk drive (DF,DK,DM,DP, or DB), TS03 or
TU10 magtape drive (MT), TU16 or TU45
magtape drive (MM), or DECtape (DT).
Using the current system disk as the
output medium (SY) is only recommended
if the system disk type is DM,DP, or DB.

Output medium ?                        *SY*(LF)

RF disk drives have limited storage cap-
acity.  If an RF drive is being used as
the system disk during the SYSGEN pro-
cedure, files will have to be deleted
from that disk after they are used.  When
the system disk is an RK05 and output
to SY has been chosen, files will also
have to be deleted after they are used
to leave enough space for the system
library.  Should files be deleted after
they are used (YES or NO).

Delete files ?                         *NO*(LF)
```

```
7 devices disabled

?Can't find file or account
.RMM\MM\ MM1:CREATE.SAV
```

Sect. 4.1
Step 13

```
^C
HELLO 1/2
Password:
1 other user is logged in under this account

.
.ASSIGN MM1: IN

.R IN:PIP.SAV
*LOGIN.SAV<232>/R
**.*<232>=IN:$LOGOUT.SAV
**.*<104>=IN:$PIP.SAV,$UTILTY.SAV/N
**.*<104>=IN:$MACRO.SAV,$CREF.SAV,$LINK.SAV/N
**.*<104>=IN:$SILUS.SAV,$HOOK.SAV,$SYSGEN.SAV/N
**.*=IN:$SYSBAT.SAV,$ERR.STB/N
*^C

.DEASSIGN IN

.R LOGOUT
Confirm: Y
Saved all disk files; 336 blocks in use
Job 2 User 1,2 logged off KB1 at 09-Nov-76 10:01 PM
1 other user still logged in under this account
System RSTS V06B-02 System
Run time was 0.4 seconds
Elapsed time was 0 minutes
Good evening


**09-Nov-76**


Beginning of RSTS/E  system  generation.
```

Sect. 4.2
Step 14

```
Questions come in long and short  forms.
If  you  are  familiar with them, answer
"S" for short; otherwise, answer "L" for
long form.

Form  ?                          #S #    L
```

```
Error message file? ERR

Installation name? Sysgen System

  Memory allocation table:

     0K: 00000000 - 00107777 (  18K) : EXEC
    18K: 00110000 - 00127777 (   4K) : RTS (RT11)
    22K: 00130000 - 02177777 ( 266K) : USER
   288K: 02200000 - End              : NXM


  Table subopt ion? EXIT

You currently have crash dump disabled.

Crash dump? YES

Mastape labelling default (none)? DOS


Option: SET

  SET subopt ion? LP
  Type (NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB)? LP
  Width (80)? 132
  Lower case (no)? YES

  SET subopt ion? EXIT


Option: START

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes? LF

Any memory allocation changes? LF

You currently have crash dump enabled.

Crash dump? LF

09-Nov-76? LF
22:00? LF
DF0: disabled - no RF: controller
DM0: disabled - no RM: controller
DM1: disabled - no RM: controller
DP0: disabled - no RP: controller
DP1: disabled - no RP: controller
MT0: disabled - no TM: controller
MT1: disabled - no TM: controller
```

Sect. 3.9
Step 10

Sect. 3.10
Step 11

```
    Size? 80

    Base? LF

  Other files? LF

  REFRESH suboption? LIST

  File                          File                  Current  Minimum  Start
  Name        Required?  Flags  Status                Size     Size     LBN

System files:

  SWAP   .SYS    YES    NOD CTG    OK                  224       64     80004
  SWAP0  .SYS    NO                OK
  SWAP1  .SYS    NO                OK
  SWAP3  .SYS    NO                OK
  OVR    .SYS    NO                OK                           43
  ERR    .SYS    NO                OK                            8
  BUFF   .SYS    YES    NOD CTG    OK                   12       6     79012
  CRASH  .SYS    NO     NOD CTG    OK                   80      24       516

Others:

  BADB   .SYS           NOD                             0
  SATT   .SYS           NOD CTG                         3                 20
  INIT   .SYS           NOD CTG                       210
  ERR    .ERR           NOD CTG                         8                276
  ROLLIN.SAV              CTG                          18
  SYSGEN.SIL            NOD CTG                       159
  RT11   .RTS           NOD CTG                        20                484


  REFRESH suboption? EXIT


Option: DEFAULT

No defaults are currently set

You currently have: JOB MAX = 2, SWAP MAX = 8K.

JOB MAX or SWAP MAX changes? YES

  New JOB MAX? LF

  New SWAP MAX? 28

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes? LF

Run Time System? RT11
```

Sect. 3.8
Step 9

```
Clean? NO

  REFRESH suboption? LIST

  File                        File                Current   Minimum     Start
  Name       Required?        Class  Status       Size      Size        LBN

System files:

  SWAP   .SYS   YES                 CRE                      64
  SWAP0  .SYS    NO                  OK
  SWAP1  .SYS    NO                  OK
  SWAP3  .SYS    NO                  OK
  OVR    .SYS    NO                  OK                       43
  ERR    .SYS    NO                  OK                        8
  BUFF   .SYS   YES                 CRE                       6
  CRASH  .SYS    NO                  OK                       24

Others:

  BADB   .SYS                  NOD                0
  SATT   .SYS             NOD  CTG                3                    20
  INIT   .SYS             NOD  CTG              210
  ERR    .ERR             NOD  CTG                8                   276
  ROLLIN.SAV                   CTG               18
  SYSGEN.SIL              NOD  CTG              159
  RT11   .RTS             NOD  CTG               20                   484


  REFRESH suboption? CHANGE

  SWAP.SYS changes? YES

    Size? 224

    Base? 80000

  SWAP0.SYS changes? LF

  SWAP1.SYS changes? LF

  SWAP3.SYS changes? LF

  OVR.SYS changes? LF

  ERR.SYS changes? LF

  BUFF.SYS changes? YES

    Size? 12

    Base? 79000

  CRASH.SYS changes? YES
```

G.1 MAGTAPE DISTRIBUTION AND RP04 SYSTEM DISK

Chap. 2
Step 1

```
RSTS V06B (MM1)


Option: DSKINT
```

Sect. 3.2
Step 3

```
DD-MMM-YY? 9-NOV-76
15:27? 9:30 PM

Disk? DB
Unit? 0
Pack ID? SYSTEM
Pack cluster size? 16
SATT.SYS base? LF
MFD password? SYSMFD
MFD cluster size? 16
PUB, PRI, or SYS? SYS
Library password? SYSLIB
Library UFD cluster size? 16
Date last modified? NO
Format? NO
Patterns? 2
Proceed (Y or N)? Y
Pattern # 2
Pattern # 1


Option: COPY
```

Sect. 3.3
Step 4

```
09-Nov-76? LF
21:52? LF

To which disk? DB
Unit? 0


RSTS V06B (DB0)


Option: INSTALL
```

Sect. 3.6
Step 7

```
  SIL? SYSGEN


Option: REFRESH
```

Sect. 3.7
Step 8

```
09-Nov-76? LF
21:53? LF

Disk? LF
```

APPENDIX G
SYSTEM GENERATION EXAMPLES

This section includes two examples of system generation from bootstrapping the distribution medium through building the large system programs. The first example shows the procedures for a large system with magtape distribution and RP04 system disk. The second example shows the procedures for a small system with RK05 disk cartridge distribution and RK05 system disk.

F.3 FIXED ADDRESS AND VECTORS

The following table lists the devices supported under RSTS/E that have fixed addresses and vectors.

Device	Address	Vector	BR Level	RSTS/E Notes
RC11/RC64	177440	210	BR5	UP TO 4 PLATTERS
RF11/RS11	277460	204	BR5	UP TO 8 PLATTERS
RK11/RK05/RK05F	177400	220	BR5	UP TO 8 DRIVES*
RK611/RK06	177440	210	BR5	UP TO 8 DRIVES
RP11C/RP02/RP03	176710	254	BR5	UP TO 8 DRIVES
RH11/RS03/RS04	172040	204	BR5	UP TO 8 DRIVES
RH11/RP04	176700	254	BR5	UP TO 8 DRIVES
RX11/RX01	177170	264	BR5	UP TO 8 DRIVES
TC11	177340	214	BR6	UP TO 8 DRIVES
TM11/TU10	172520	224	BR5	UP TO 8 DRIVES
RH11/TM02/TU16	172440	224	BR5	UP TO 8 DRIVES
LP11, LS11 (LP0)	177514	200	BR4	UP TO 8 PRINTERS
(LP1)	164004	170	BR4	DEPENDING ON
(LP2)	164014	174	BR4	SPEED.
(LP3)	164024	270	BR4	
(LP4)	164034	274	BR4	
(LP5)	164044	774	BR4	
(LP6)	164054	770	BR4	
(LP7)	164064	764	BR4	
CR11, CM11	177160	230	BR5	
CD11	177160	230	BR4	
KW11L	177546	100	BR6	
KW11P	172540	104	BR6	
KG11	170700	NONE	NONE	2780 ONLY
KL11, DL11A, DL11B	177560	60	BR4	CONSOLE INTERFACE

* Each RK05F must be counted as two drives.

F.4 RH70 BAE AND CS3 ADDRESSES

The following table lists the four possible RH70 High Speed I/O Controller addresses, their Bus Address Extension (BAE) and Control addresses, their Bus Address Extension (BAE) and Control Status 3 (CS3) addresses, and their usages.

Usage	Address	BAE	CS3
RS03/RS04 only	172040	172070	172072
TM02/TU16 only	172440	172474	172476
mixed/nonstandard	176300	176350	176352
RP04/RP05/RP06 only	176700	176750	176752

F.2 FLOATING VECTORS

Many devices have floating vectors. The vector assignment sequence is normally the same sequence as that in which the devices enter production. A vector for a new hardware option is not inserted before the vector for a device that is already in production. Gaps in the vector assignments are not required. The floating vectors begin at address 300 and proceed continuously upwards. The vector assignment sequence for current devices is defined below.

Device	First Address	Next Addr.	Vector Size	Max # Units	BR Level	RSTS/E Notes
DC11	174000	+10	10	32	BR5	
KL11,DL11A,B	176500	+10	10	16	BR4	NON-CONSOLE
DP11	174770	–10	10	32	BR5	2780 ONLY***
DM11A	175000	+10	10	16	BR5	NOT SUPPORTED
DN11	175200	+10	4	16	BR4	NOT SUPPORTED
DM11BB	170500	+10	4	16	BR4	
DR11A,C	167770	–10	10*	32	BR5	NOT SUPPORTED
PA611 READER	172600	+ 4	4*	16	BR4	NOT SUPPORTED
PA611 PUNCH	172700	+ 4	4*	16	BR4	NOT SUPPORTED
DT11 (DT03-FP)	174200	+ 2	10*	8	BR7	NOT SUPPORTED
DX11	176200	+40	10*	4	BR4	NOT SUPPORTED
DL11C,D,E	175610	+10	10*	31	BR4	
DJ11	FLOAT	+10	10*	16	BR5	
DH11	FLOAT	+20	10*	16	BR5	
GT40	172000		20*		BR4	NOT SUPPORTED
LPS11	170400	+40	30*	14	BR5,6	NOT SUPPORTED
DQ11	FLOAT	+10	10*	16	BR5	NOT SUPPORTED
KW11W	172400	NA	10*	1		NOT SUPPORTED
DU11	FLOAT	+10	10*	16	BR5	2780 ONLY***
DUP11	FLOAT	+10	10*	16	BR5	2780 ONLY***
DV11	175000	+40	20*	4	BR5,6	NOT SUPPORTED
LK11	FLOAT	+10	10*	1	BR4	NOT SUPPORTED
DMC11	FLOAT	+10	10*	16	BR5	DECNET/E ONLY**
DZ11	FLOAT	+10	10*	8	BR5	

* The first vector for the first device of this type must always be on a 10(8) boundary.

** DECNET/E limits the maximum number of units to eight.

*** Also supported at BR6 under RSTS/2780.

FLOATING ADDRESS WORKSHEET

DEVICE

ADDRESS	DJ11	DH11	DQ11	DU11	DUP11	LK11	DMC11	DZ11
760000								
760010								
760020								
760030								
760040								
760050								
760060								
760070								
760100								
760110								
760120								
760130								
760140								
760150								
760160								
760170								
760200								
760210								
760220								
760230								
760240								
760250								
760260								
760270								
760300								
760310								
760320								
760330								
760340								
760350								
760360								
760370								
760400								
	DJ11	DH11	DQ11	DU11	DUP11	LK11	DMC11	DZ11

DEVICE

ADDRESS	DJ11	DH11	DQ11	DU11	DUP11	LK11	DMC11	DZ11
760400								
760410								
760420								
760430								
760440								
760450								
760460								
760470								
760500								
760510								
760520								
760530								
760540								
760550								
760560								
760570								
760600								
760610								
760620								
760630								
760640								
760650								
760660								
760670								
760700								
760710								
760720								
760730								
760740								
760750								
760760								
760770								
761000								
	DJ11	DH11	DQ11	DU11	DUP11	LK11	DMC11	DZ11

DEVICE

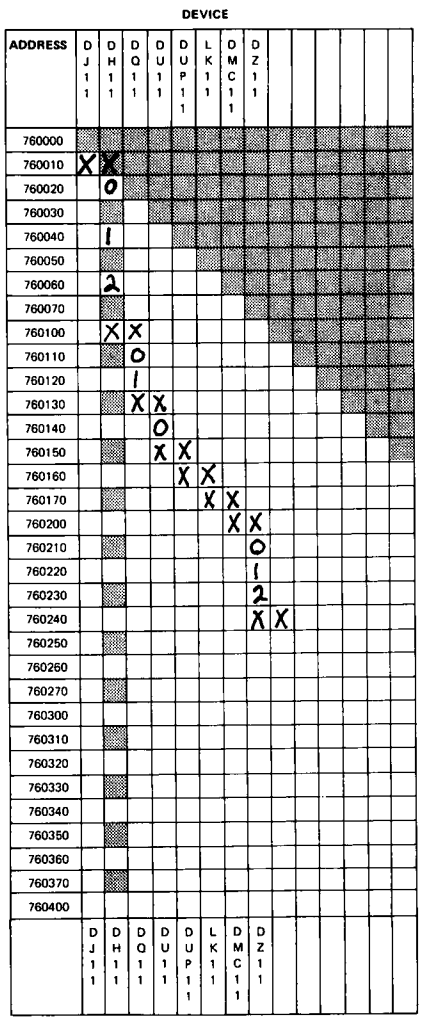
ADDRESS	DJ11	DH11	DQ11	DU11	DUP11	LK11	DMC11	DZ11
761000								
761010								
761020								
761030								
761040								
761050								
761060								
761070								
761100								
761110								
761120								
761130								
761140								
761150								
761160								
761170								
761200								
761210								
761220								
761230								
761240								
761250								
761260								
761270								
761300								
761310								
761320								
761330								
761340								
761350								
761360								
761370								
761400								
	DJ11	DH11	DQ11	DU11	DUP11	LK11	DMC11	DZ11

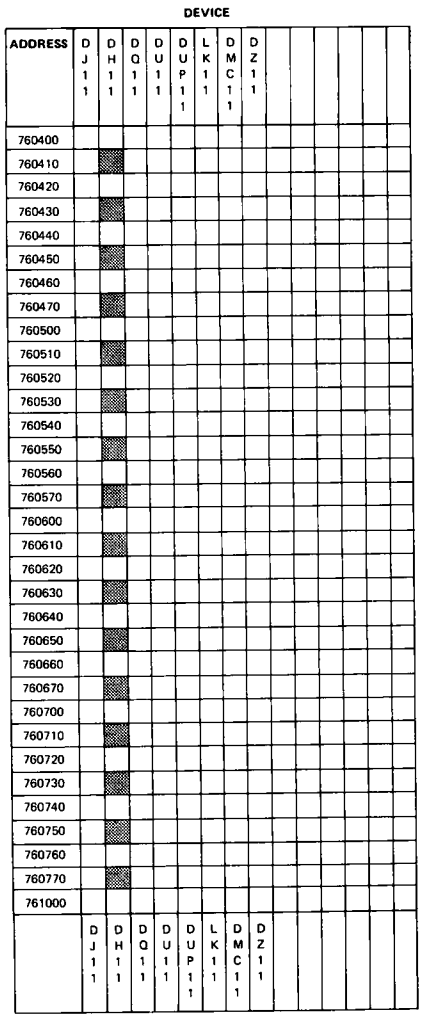
DEVICE

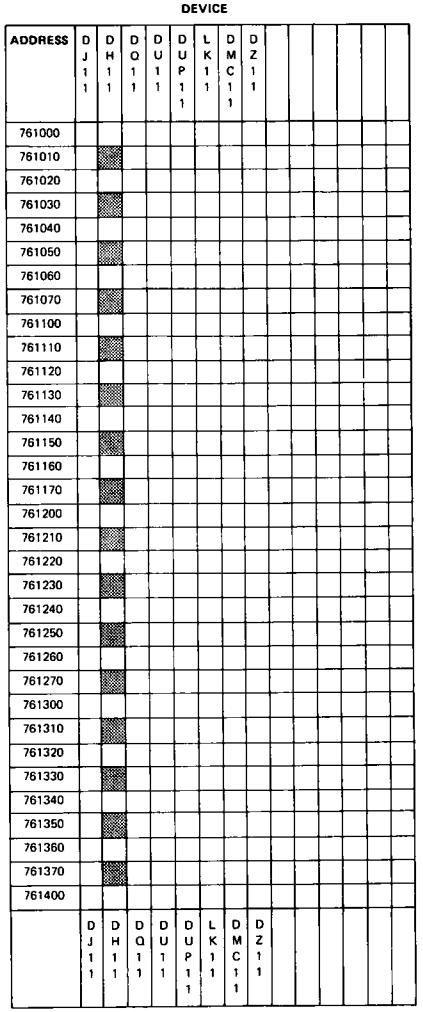
ADDRESS	DJ11	DH11	DQ11	DU11	DUP11	LK11	DMC11	DZ11
761400								
761410								
761420								
761430								
761440								
761450								
761460								
761470								
761500								
761510								
761520								
761530								
761540								
761550								
761560								
761570								
761600								
761610								
761620								
761630								
761640								
761650								
761660								
761670								
761700								
761710								
761720								
761730								
761740								
761750								
761760								
761770								
762000								
	DJ11	DH11	DQ11	DU11	DUP11	LK11	DMC11	DZ11

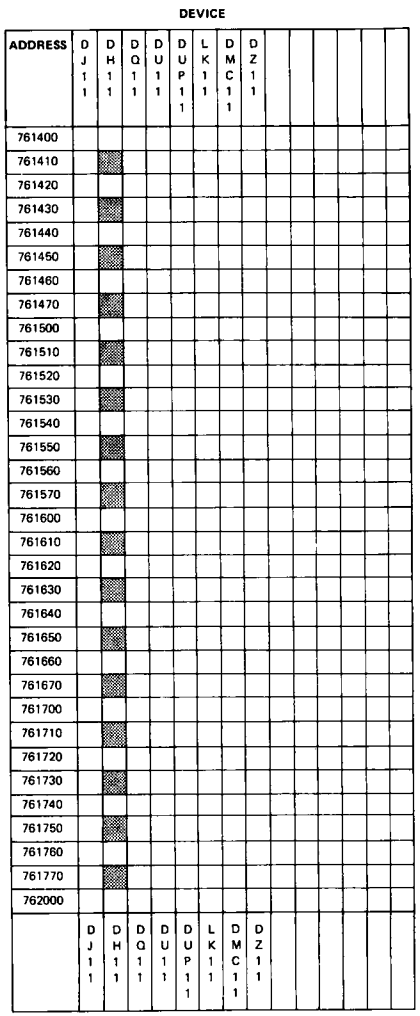
	QTY (n)		QTY (n)	DEV	UNIT	ADDRESS	DEV	UNIT	ADDRESS	DEV	UNIT	ADDRESS
DJ11	_____	DMC11	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DH11	_____	DZ11	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DQ11	_____		_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DU11	_____		_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DUP11	_____		_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
LK11	_____		_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

FLOATING ADDRESS WORKSHEET (EXAMPLE 2)









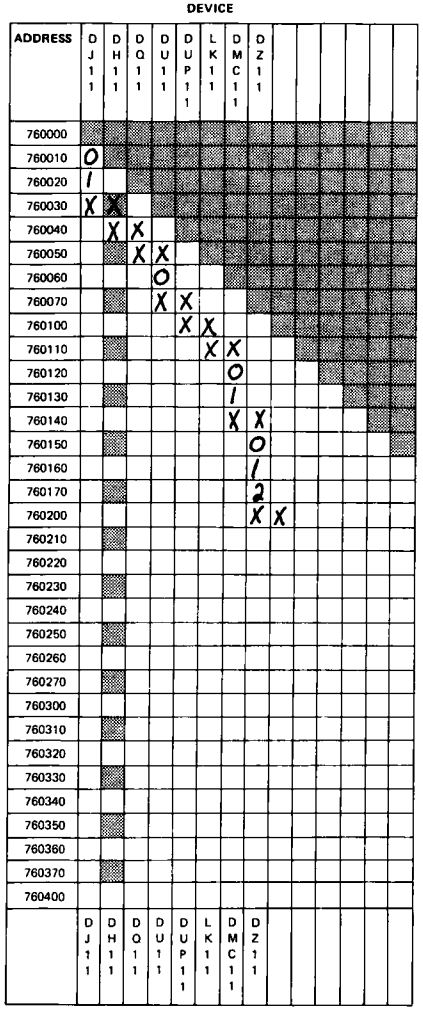
	QTY (n)		QTY (n)
DJ11	0	DMC11	0
DH11	3	DZ11	3
DQ11	2		
DU11	1		
DUP11	0		
LK11	0		

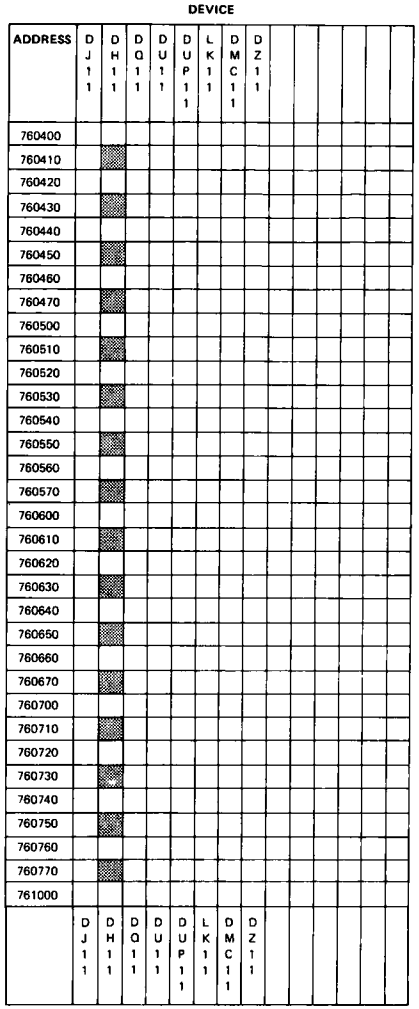
DEV	UNIT	ADDRESS
DH	Ø	760020
DH	1	760040
DH	2	760060
DQ	Ø	760110
DQ	1	760120
DU	Ø	760140

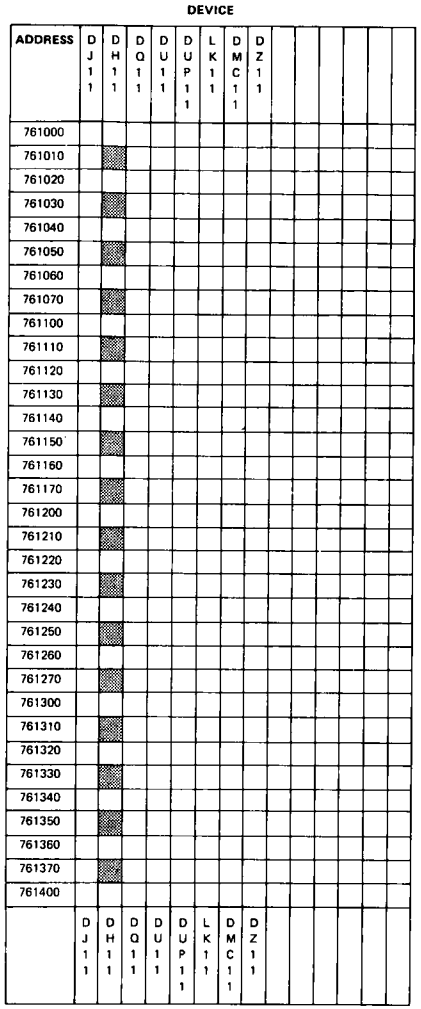
DEV	UNIT	ADDRESS
DZ	Ø	760210
DZ	1	760220
DZ	2	760230

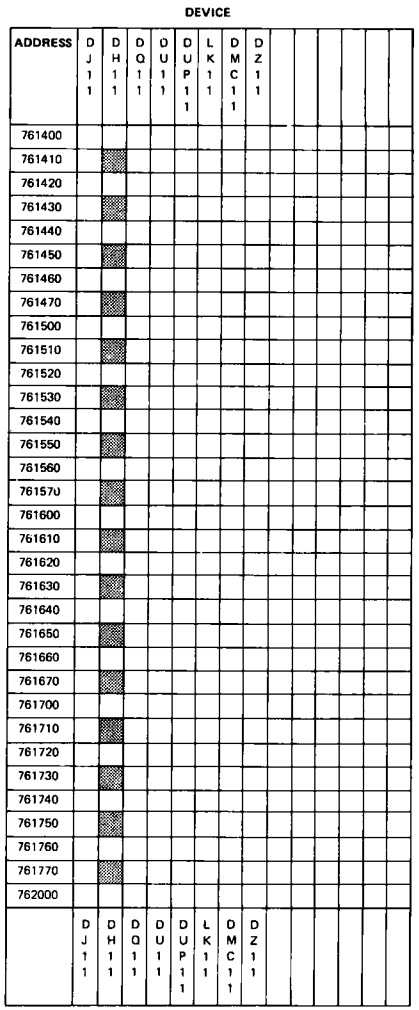
DEV	UNIT	ADDRESS

FLOATING ADDRESS WORKSHEET (EXAMPLE 1)









	QTY (n)		QTY (n)
DJ11	2	DMC11	2
DH11	0	DZ11	3
DQ11	0		
DU11	1		
DUP11	0		
LK11	0		

DEV	UNIT	ADDRESS
DJ	0	760010
DJ	1	760020
DU	0	760060
DMC	0	760120
DMC	1	760130
DZ	0	760150

DEV	UNIT	ADDRESS
DZ	1	760160
DZ	2	760170

DEV	UNIT	ADDRESS

After all DJ11 addresses and the DJ11 gap are defined, the address for the first DH11 can be assigned. DH11's have eight registers which implies a modulo 20 (base 8) boundary. The address of the first DH11 is the first modulo 20 address following the DJ11 gap. If there are no DJ11's (DJ11 gap at 760010), the first DH11 is assigned address 760020. Similarly, if there is one DJ11, the DJ11 gap will begin at 760020 and the next available mod 20 boundary is 760040. All additional DH11's are assigned addresses modulo 20 immediately after the first DH11. The DH11 gap begins on the 20 boundary following the last DH11.

After all DH11 addresses and the DH11 gap are defined, DQ11, DU11, DUP11, LK11, DMC11, and DZ11 addresses and the required gaps can be assigned in sequence. Addresses for any future floating address devices will be assigned in a similar manner.

FLOATING ADDRESS WORKSHEET

The algorithm for assignment of floating addresses can be confusing for a large configuration with multiple units of several types of floating address devices. The floating address worksheet that follows is a graphic aid that should eliminate some confusion and relieve configuration problems. The worksheet allows you to assign device addresses quickly without referring to the formal rules. Instructions for use of the worksheet are presented below and two configuration examples follow. A blank worksheet is also provided for general use.

The worksheet is divided into four sections covering the address range 760010 through 762000. Although the floating address area continues up to address 764000, the worksheet should cover most configurations. If necessary, you can create a second worksheet by adding 2000 to all addresses listed.

The following are the instructions for the use of the worksheet:

1. Record the quantity of each type of floating address device in the space provided on the worksheet.
2. Beginning at the upper left of the worksheet at address 760010 and proceeding down the DJ11 column, record the unit numbers for all DJ11's in the configuration. Begin with unit 0 and end with unit n-1. (There are n DJ11's in the configuration.)
3. Immediately below the last DJ11 unit, mark an X for the required DJ11 address gap. Also mark an X in the box immediately to the right (DH11 column).

   In general, when numbering device units down the appropriate column, use only the unshaded boxes. The shaded boxes represent illegal addresses for the particular device type. Since the gap address must also be a legal device address, use only an unshaded box for the gap X when numbering down a column.

   In marking an X in the column to the right of a device address gap, use shaded boxes since the X in the next column merely provides a starting point for numbering units of the next device type. If there are no units of a particular device type, enter only the gap X's on the worksheet.

   If you use all available space in one section of the worksheet, simply copy the entries on the last line of the full section to the top line of the next section. Then continue numbering in the new section.
4. Continuing just below the X in the DH11 column, number all DH11 units. Once again, start with unit 0 and continue to unit n-1. Skip the shaded boxes in numbering down the column. In the first unshaded box below the last DH11 unit, mark an X for the DH11 gap. Also mark an X in the box to the right, whether it is shaded or unshaded.
5. Continue with the remaining floating address devices. In each case, number units from 0 to n-1 down the column beginning in the first unshaded box below the X. Mark an X in the next unshaded box below the last unit and in the box immediately to the right of the last unit (whether that box is shaded or unshaded).
6. After you have recorded all floating address devices, you can read the UNIBUS address for each device unit directly from the worksheet.

APPENDIX F
ADDRESS AND VECTOR ASSIGNMENTS

The RSTS/E system initialization code performs a hardware configuration check each time the system disk (or distribution medium) is bootstrapped. In the absence of any information to the contrary, the initialization code assumes that all devices attached to the UNIBUS have been assigned addresses according to the manufacturing standards. The initialization code determines interrupt vectors automatically by forcing each supported device to interrupt. Although the HARDWR initialization option allows you to declare nonstandard address and vector assignments, DIGITAL recommends that the standard configuration rules be followed whenever possible.

Several devices have so called "Floating Addresses." This means that the presence or absence of any floating address device will affect the assignment of addresses to other floating address devices. Similarly, many devices have "Floating Vectors." According to the standards, interrupt vectors must be assigned in a specific sequence and the presence of one type of device will affect the correct assignment of interrupt vectors for other devices. Finally, there are many options that have fixed addresses and vectors. This appendix presents the algorithms for assignment of floating addresses and vectors. It also lists the fixed assignments for devices supported by RSTS/E.

F.1 FLOATING ADDRESSES

Currently the floating address devices include the DJ11 and DH11 multiplexers; the DQ11, DU11, and DUP11 synchronous line interfaces; the LK11; the DMC11 interprocessor link; and the DZ11 multiplexer. The following ground rules apply to these devices and future floating address devices:

1. Only new devices will be assigned floating addresses. Devices now in production will keep their old addresses.
2. Future devices may float both their addresses and interrupt vectors.
3. The floating address space starts at 760010(8) and proceeds upward to 764000(8).
4. A gap in the address space (no SLAVE SYNC) implies that a device does not exist.
5. The first address of a new type device will always be on a 2↑N word boundary, where N is the integer value of (LOG_2 M+.9999999), and M is the number of device registers.

Number of Registers In Device	Possible Boundaries
1	Any Word
2	XXXXX0, XXXXX4
3,4	XXXXX0
5,6,7,8	XXXX00, XXXX20, XXXX40, XXXX60
9 thru 16	XXXX00, XXXX40

6. A "gap" of at least one word will be left after each type of device, starting on the same boundary the device would start on. Note that the gap must be at least one word in length but may be longer than one word. Gap length is determined by the boundary on which the next device must begin.
7. Multiple devices of the same type must be addressed contiguously.

Address 760010 is reserved for the first DJ11. Since the DJ11 has four registers, additional DJ11's are assigned addresses modulo 10 (base 8) immediately following the first DJ11 (i.e., 760010, 760020, etc.). The modulo 10 (base 8) address following the last DJ11 is left empty and is known as the DJ11 gap. If there are no DJ11's, the gap is at 760010. If there is one DJ11, the gap will be at 760020. All gaps must be at least one word in length.

APPENDIX E

SPECIAL SYSGEN OPTIONS

During development of the RSTS/E system, several hidden options were built into the SYSGEN program to assist DIGITAL development personnel with system generations and performance analysis. Nonstandard answers to several SYSGEN questions invoke the hidden options. Support for these options is neither expressed nor implied by this document. The following sections list the SYSGEN questions of interest and include a brief explanation of the nonstandard answers that invoke the special options.

E.1 FORM?

Usual responses are L, to receive the long form questions and S, to receive the short form questions.

If you append /Q to your answer, the SYSGEN program adds special statistics gathering code to the monitor. This code includes tables that record job and disk queue statistics. It is intended for performance analysis at DIGITAL and is not a supported feature of RTS/E.

E.2 DECNET NETWORK SUPPORT?

Usual responses are YES, to include support for DECNET/E and NO, to omit support for DECNET/E.

Normally, only systems that support the DECNET/E package include the DMC11 synchronous communication line interface. However, you can include DMC11s without support for DECNET/E by typing NO/D in response to this question.

Table D-2 BASIC-PLUS Module Sizes

Module	Decimal Words
Compiler and RTS	11373
Math Packages	
MA2, XL2, XT2	2467
MA2	1995
MA2I, XL2I, XT2I	2133
MA2I	1661
MA2F, XL2F, XT2F	1934
MA2F	1595
MA4, XL4, XT4	3480
MA4	2729
MA4F, XL4F, XT4	2390
MA4F	1921
Optional Features	
Print Using	724
Matrices	752
String Arithmetic	874
Math Functions	
Trig Functions	323
Log Functions	392
Common Polynomial Calculation	43

Table D-1 (Cont.) System Module Sizes

Module	Decimal Words	Comments
Floppy Disk	352	Add 12 per unit for DDB.
Pseudo Keyboards	134	Add 5 per unit for DDB.
Paper Tape Reader	101	Add 8 per unit for DDB.
Paper Tape Punch	95	Add 8 per unit for DDB.
Line Printer	456	Add 14 per unit for DDB.
CR11/CM11 Card Reader	256	Add 89 per unit for DDB.
CD11 Card Reader	272	Add 89 per unit for DDB.
Card Decode Table	128	
Big Buffer	48	For TU16/TU45 or TU10/TS03 magtape, but no DECtape.
	256	For DECtape with or without magtape.
Terminal Option Support		
Terminals		Add 21 per unit for DDB.
Echo Control	236	Add 4 per unit for DDB.
Multi-Terminal Service	163	
2741 Support	200	Add 2 per unit for DDB.
Single Line	+100	
DH11	+100	
DZ11	+100	
Code Table	+128 per code	Up to four codes allowed.

APPENDIX D

SYSTEM MODULE SIZES

Table D-1 supplies the approximate memory sizes of software modules on RSTS/E. Table D-2 supplies approximate memory sizes for BASIC-PLUS modules. By summing the values given, you can estimate the total size of the system.

Table D-1 System Module Sizes

Module	Decimal Words	Comments
Monitor Options		
FIP Buffering	491	Up to 30 logical names allowed
Small Buffers	16 per buffer	
System Wide Logical Names	5 per name	Up to 30 logical names allowed
Resident FIP Functions		
Disk Handling	1679	
Send/Receive	462	
Simple SYS Calls	252	
File Delete/Rename	218	
Login/Attach	388	
Directory Lister	191	
Disk Support		
RC Disk	41	RC11/RS64
RF Disk	51	RF11/RS11
RS Disk	56	RS03/RS04
RK Disk (nonoverlapped)	100	RK05/RK05F
RK Disk (overlapped)	240	
RM Disk (nonoverlapped)	323	RK06
RM Disk (overlapped)	427	
RP Disk (nonoverlapped)	106	RP02/RP03
RP Disk (overlapped)	222	
RB Disk (nonoverlapped)	252	RP04/RP05/RP06
RB Disk (overlapped)	327	
Queue Optimize	45	For RK, RM, RP, or RB disks
ECC Module	42	For RM or RB disks
Device Support		
TU16/TU45 Magtape	728	Add 19 per unit for DDB
TU10/TS03 Magtape	717	Add 19 per unit for DDB
DECtape	430	Add 16 per unit for DDB

APPENDIX C
DISK DEVICE SIZES

The following table lists the device cluster size and device size (in 256-word blocks) for each of the disk devices supported by RSTS/E.

Table C-1
Disk Device Sizes

Disk Device	Device Cluster Size	Device Size
RS64	1	256 * (number of platters)
RS11	1	1024 * (number of platters)
RS03	1	1024
RS04	1	2048
RK05	1	4800
RK05F	1	4800 for each unit; 2 units for each drive
RK06	1	27104
RP02	2	40000
RP03	2	80000
RP04	4	167200
RP05	4	167200
RP06	8	334400

Table B-3 (Cont.)
RT11 Run-Time System Fatal Execution Errors

Message	Meaning
?PROGRAM LOST – SORRY	An unrecoverable error occurred. The run-time system resets user core image.
?M-TOO MANY OPEN CHANNELS	The job attempted to open more than 15 channels or attempted to open two DECtape files at once.
?M-TRAP TO 4	The program trapped to the vector at location 4.
?M-TRAP TO 10	The program trapped to the vector at location 10.
?M-TRAP TRAP	The job issued the TRAP instruction, but the job has an illegal vector location.

B.3 BATCH ERROR MESSAGES

During the execution of the batch streams associated with CREATE.SAV and SYSBAT.SAV, two types of errors may occur. The RT11 run-time system returns most errors. The batch program translates these errors to their BASIC-PLUS equivalents and prints the BASIC-PLUS error message text. You can find a discussion of BASIC-PLUS error messages in Appendix C of the *BASIC-PLUS Language Manual.* The batch program itself may generate several other errors. Table B-4 summarizes these errors.

Table B-4
BATCH Error Messages

Message 1	Meaning
DEVICE NOT MOUNTED	The batch stream attempted to dismount a device that was not mounted.
ERROR DURING PSEUDO KEYBOARD INPUT	An error occurred during input to the pseudo keyboard.
ERROR DURING PSEUDO KEYBOARD OUTPUT	An error occurred during output to the pseudo keyboard.
INVALID CARD	A line contained a command in an incorrect format.
INVALID SWITCH	A switch used in the command field or in the specification field is undefined or in an incorrect format.
JOB FAILED TO LOG IN	The job cannot log in because the LOGIN program or the requested account was missing.
MOUNT ERROR	The volume to be mounted was not correct (pack IDs do not match) or the device was already in use.
TOO MANY MOUNTED DEVICES	The job requested the mounting of more than twelve devices.

Table B-2
Recoverable RT11 Run-Time System Errors

Message	Meaning
?ADDR?	You specified an illegal address with an E, D, or B command.
?BAD LOAD?	RT11 encountered an error when reading the program into memory.
?BAD PPN?	You typed an illegal PPN in response to a LIB or PPN command.
?BAD START ADDRESS?	The program start address was odd or out of bounds.
?FIL NOT FND?	The specified file cannot be found.
?FILE?	You specified no filename or an illegal filename with the R, RUN, or GET command.
?ILL CMD?	You typed an illegal command. The command includes an unrecognized command, a syntax error in a command string, a command line longer than 510 characters, or an attempt to change to an illegal size (2<size<swap max for this job).
?ILL DEV?	The command string includes an illegal device name.
?NO RESTART?	You typed the RESTART command, but the program is not restartable.
?OVR CORE?	The program is too large to fit into memory.

Table B-3
RT11 Run-Time System Fatal Execution Errors

Message	Meaning
?M-BPT TRAP	The program issued a BPT instruction, but the job has an illegal vector location.
?M-FP TRAP	A floating point trap occurred.
?M-HALT	The program halted.
?M-ILL EMT	The program issued an invalid monitor call.
?M-IOT TRAP	The program issued an IOT instruction, but the job has an illegal vector location.
?M-OVLY ERR	The RT11 run-time system encountered an error while reading a program overlay. This message may indicate a hardware error.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
USER-DEFINED ADDRESS FOR xx: NOT FOUND – DEVICE DISABLED	Use HARDWR to set the correct CSR address for xx:, or call the DIGITAL field service engineer.
USING KW11L CLOCK	Warning message only. The installed SIL is configured for a KW11P clock, but the KW11P clock is not present. RSTS/E uses the KW11L clock instead.
USING KW11P CLOCK AT LINE FREQUENCY	Warning message only. The installed SIL is configured for a KW11L clock, but the KW11L clock is not present. RSTS/E uses the KW11P clock instead.
VECTOR FOR DEVICE xx: (nnnn) ALREADY IN USE – DEVICE DISABLED	Use HARDWR to set the correct vector address for xx:, or call the DIGITAL field service engineer.
WARNING – BAD BLOCK DOUBLY ALLOCATED TO BADB.SYS	Warning message only.
WARNING ** DBn: IS DUAL PORTED, PROCEED WITH CAUTION	Warning message only.
WARNING – DCN IN BADB.SYS NOT ON PACK CLUSTER BOUNDARY	Warning message only.
WARNING – xxx FILE NOT FOUND – PLEASE SET DEFAULTS	The SIL you are installing specifies a default run-time system or error message file that is not present. Use the DEFAULT option to specify a valid file.
WARNING – FILE filnam.ext NOT FOUND WHEN REMOVING OLD SIL	Warning message only.
WARNING – ODT IN THE SIL IS IN AN ILLEGAL FORMAT	Warning message only.
WARNING – SUBLINES for xx: ARE OUT OF SEQUENCE	Warning message only, but the system may crash. Regenerate.

B.2 RT11 RUN-TIME SYSTEM ERROR MESSAGES

The RT11 run-time system can generate the errors described in Tables B-2 and B-3.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
SYSTEM DISK DISABLED IN MONITOR	Use the SET option to enable the system disk device.
TOO MANY BLOCKS IN DEVICE CONFIGURATION TABLE	Regenerate.
TOO MANY xx: CONTROLLERS GENERATED	Ensure that any edits to CONFIG.MAC are correct. If there are no editing errors, regenerate the system.
TOO MANY RH OR UNIBUS DEVICES	Submit an SPR.
TOO MANY SUBLINES FOR nn:	Ensure that any edits to CONFIG.MAC are correct. If there are no editing errors, regenerate the system.
TOO MANY UNIBUS DEVICES ON THIS 11/70	First, disable unnecessary devices with HARDWR or SET. If the error condition persists, use DEFAULT to lock all memory addresses above 124K. (The computer runs in 18-bit addressing mode instead of 22-bit addressing mode.) If the error condition is present after you lock memory, or if the computer has 124K words of memory or fewer, submit an SPR.
TOO MUCH MODIFICATION TO MONITOR REQUIRED	Regenerate to produce a monitor that is more closely configured to your system hardware.
UFD HAS SIZE TOO LARGE FOR FILE	Warning message only. CLEAN corrects the condition.
UFD HAS SIZE TOO SMALL FOR FILE [P,PN] filnam.ext – FIXED BY CLEAN	Warning message only. CLEAN corrects the condition.
[0,1] UFD NOT FOUND	Reinitialize the disk.
UNABLE TO CREATE REQUESTED FILE(S)	Delete some files and retry the procedure, or request smaller files. Also, try using the FILE suboption of REFRESH to create files one at a time.
UNEXPECTED TRAP THROUGH THE VECTOR AT nnn	Submit an SPR.
UNKNOWN DEVICE BOOTED	Submit an SPR.
UNKNOWN RH CONTROLLER PRESENT	Call the DIGITAL field service engineer to correct the hardware configuration.
UNRECOVERABLE DISK ERROR ON xxn:	Ensure that the disk is mounted and write-enabled (if necessary). If the disk is properly mounted, this error indicates a fatal disk error. Reformat and reinitialize the disk, or use a different disk.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
REQUIRED MODULE xxxxxx IS IMPROPERLY LINKED	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx NOT FOUND IN SIL	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx OUT OF SEQUENCE IN SIL	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx TOO LARGE	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx TOO SMALL	Regenerate. If the error recurs, submit an SPR.
REQUIRED SYMBOL xxxxxx MISSING FROM MONITOR	Regenerate. If the error recurs, submit an SPR.
RSTS/E REQUIRES EIS!	Correct the hardware configuration to include EIS.
RSTS/E REQUIRES A CLOCK!	Correct the hardware configuration to include a KW11P or KW11L clock.
RSTS/E REQUIRES MEMORY MANAGEMENT HARDWARE!	Correct the hardware configuration to include a memory management unit.
SATT.SYS IS OVER 16. BLOCKS LONG	If the file structure on the disk is sound, submit an SPR. Otherwise, reinitialize the disk.
SATT.SYS NON-EXISTENT AT TIME OF READ	If the file structure on the disk is sound, submit an SPR. Otherwise, reinitialize the disk.
SATT.SYS NOT FOUND – RESULTS UNPREDICTABLE	Rebootstrap the system and retry the operation. If the error recurs, reinitialize the disk.
filnam.SIL NOT FOUND – PLEASE INSTALL A SIL	The SIL that you previously installed is not on the disk. Use the INSTALL option to install a monitor SIL.
SWAP.SYS NOT CONTIGUOUS OR TOO SMALL	Use the REFRESH option to create a contiguous SWAP.SYS of the correct size.
SWAP.SYS NOT PRESENT IN [0,1]	Use the REFRESH option to create SWAP.SYS in [0,1]
SYMBOL xxxxxx NOT FOUND IN MONITOR SYMBOL TABLE	Regenerate. If the problem recurs, submit an SPR.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
NO ROOM FOR 2 JOBS IN SWAP.SYS	Use REFRESH to increase the size of SWAP.SYS so that it can accommodate two jobs of size SWAP MAX.
NOT ENOUGH ROOM IN LOW MEMORY FOR MONITOR	Generate a smaller monitor.
NOT ENOUGH ROOM IN MEMORY FOR RUN TIME SYSTEM	Generate a smaller monitor or run-time system.
ONE OR MORE SYSTEM FILES MISSING	Reinitialize the disk.
OPTION ATTEMPTED DURING BOOT-STRAP PHASE	Rebootstrap the system and retry the operation. If the retry fails, submit an SPR.
OPTION NOT AVAILABLE	The option you requested is not available until you bootstrap the system disk.
OUTPUT DISK IS DIRTY – CANNOT PROCEED	Use REFRESH to clean the disk or use DSKINT to reinitialize the disk.
OVERLAY HANDLER IN ERROR	Submit an SPR.
OVR NOT IN SIL	Regenerate.
PACK CLUSTER SIZE IS NOT 1, 2, 4, 8, OR 16	Reinitialize the disk.
PERMANENTLY MAPPED REGION OF MONITOR IS TOO LARGE	Regenerate to create a smaller monitor. Configure fewer small buffers or less resident code.
PRIORITY OF xx: INTERRUPT (PRn) IS TOO HIGH – DEVICE DISABLED	Call the DIGITAL field service engineer to install the device correctly.
QUESTION ATTEMPTED DURING AUTO-RESTART	If the system disk needs cleaning, start the system by typing START or LINE FEED, thereby cleaning the disk. If any other problem occurs, submit an SPR.
REQUESTED DISK DRIVE NOT FOUND	Request a disk that is on the system.
REQUIRED MODULE xxxxxx HAS INVALID LENGTH	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx HAS INVALID TRANSFER ADDRESS	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx HAS WRONG LOAD ADDRESS	Regenerate. If the error recurs, submit an SPR.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
INVALID ACCOUNT NUMBER [P,PN]	CLEAN deletes the account after requesting your confirming response.
INVALID DATA IN ERROR RECORD SECTOR # n	Warning message only. The error occurred during reading of factory error records. Disregard the error message.
INVALID FILE STRUCTURE ON OUTPUT DISK	Reinitialize the disk as a system disk.
INVALID RETRIEVAL ENTRIES FOR FILE [p,pn] filnam.ext – FIXED BY CLEAN	Warning message. CLEAN truncates the file.
I/O TO UNOPENED FILE	Submit an SPR.
MFD NAME ENTRY CONTAINS A BAD LINK. CLEAN WILL DELETE ALL [1,1] FILES AND ALL ACCOUNTS BEYOND [p,pn] filnam.ext	CLEAN confirms your response.
MONITOR SIL CHANGED – REINSTALL IT	Use the INSTALL option to install the monitor SIL.
MONITOR SIL NOT FOUND	Use the INSTALL option again to install the SIL. If the error recurs, submit an SPR.
MONITOR TOO BIG	Regenerate the monitor to support fewer devices, fewer optional software elements, or fewer small buffers.
MOS PARITY CSR FOUND, BUT NOT RELATING TO MEMORY	Call the DIGITAL field service engineer.
MT, MM } ERROR OR INVALID FORMAT ON TAPE	Ensure that the magtape drive heads are clean and correctly aligned. If the error recurs, try using a different drive.
NO LIBRARY ACCOUNT ON THIS DISK	Reinitialize the disk and create a library account.
NO ROOM FOR DIRECTORY ON OUTPUT DISK	Delete files or reinitialize the disk to create sufficient contiguous space on the disk for the file. Or use a different disk.
NO ROOM FOR FILE ON OUTPUT DISK	Delete files, reinitialize the disk to create sufficient contiguous space on the disk for the new file, use a different disk.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
INIT BUG – FAILED TO FIND FILE JUST CREATED	Submit an SPR.
INIT BUG – FILE EXISTS WHEN TRYING TO CREATE	Submit an SPR.
INIT BUG – xxx –file type FILE NOT FOUND 2ND TIME	Submit an SPR.
INIT BUG – FILE SIZE COMPUTED WRONG	Ensure that the system device you are using contains a valid system. If so, submit an SPR.
INIT BUG – FLOAT TABLE ERROR	Submit an SPR.
INIT BUG – INSTALL NOT SYNCHRONIZED AT xxxxxx	Submit an SPR.
INIT BUG – NO UFD FOUND IN CREATE	Submit an SPR.
INIT BUG – RNB TO WRONG DISK	Submit an SPR.
INIT BUG – SATT.SYS NON-EXISTENT AT TIME OF WOMP	Submit an SPR.
INIT BUG – START LINKED TOO LOW	Submit an SPR.
INIT LINK BUG – DEFBUF NOT ALIGNED.	Submit an SPR.
INIT LINK BUG – FIBUF NOT ALIGNED	Submit an SPR.
INIT LINK BUG – INSBUF NOT ALIGNED	Submit an SPR.
INIT.SYS NOT FOUND – RESULTS ARE UNPREDICTABLE	Rebootstrap the system disk and retry the operation. If the retry fails, reinitialize the disk.
INPUT FILE MISSING FROM SYSTEM DEVICE	Retry the procedure that generated the error. If the error recurs, submit an SPR.
INSTALLED MONITOR DOES NOT SUPPORT THIS SYSTEM DISK	Regenerate a monitor that supports the system disk or use the COPY option to transfer the monitor to a disk it supports.
INSTALLED SIL INVALID	The installed SIL is invalid as a monitor SIL. Use the INSTALL option to install a valid SIL.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
filnam.ext HAS ILLEGAL FORMAT AND CANNOT BE COPIED	Submit an SPR if DIGITAL supplied the file on the distribution medium. Regenerate if the system generation process created the file.
FORMATTING FAILURE:	Press the LINE FEED key to retry. Type anything else to abort the DSKINT and return to the OPTION: prompt. Ensure that the disk drive is write enabled. This error may indicate a bad disk pack or a bad disk drive.
[P,PN] HAS A BAD BLOCK	CLEAN asks whether to delete the account and confirms your response.
[P,PN] HAS HOLES IN CLUSTER MAP	CLEAN asks whether to delete the account and confirms your response.
[P,PN] HAS INCONSISTENT CLUSTER MAPS	CLEAN asks whether to delete the account and confirms your response.
[P,PN] HAS INVALID CLUSTER SIZE	CLEAN asks whether to delete the account and confirms your response.
ILLEGAL INTERFACE INDEX nn	Regenerate. If the error recurs, submit an SPR.
INIT BUG – BAD DISK INDEX	Submit an SPR.
INIT BUG – CAN'T ALLOCATE FILE 2ND TIME	Submit an SPR.
INIT BUG – CAN'T FIND [0,1] AGAIN	Submit an SPR.
INIT BUG – CAN'T FIND FILE TO DELETE	Submit an SPR.
INIT BUG – CLEAN FAILED TO FIND ALLOCATION ERROR	Submit an SPR.
INIT BUG – DIDN'T GET SAME CLUSTER 2ND TIME	Submit an SPR.
INIT BUG – DIDN'T GET SAME FILE CLUSTER 2ND TIME	Submit an SPR.
INIT BUG – FAILED TO CREATE FILE	Submit an SPR.
INIT BUG – FAILED TO FIND FILE AGAIN	Submit an SPR.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
DSKINT ERROR – ATTEMPT TO FORMAT UNFORMATTABLE DISK	Submit an SPR.
DSKINT OR SYSGEN ERROR – DSKINT ALLOCATION FAILURE	Submit an SPR.
EOF READING INIT.SYS	Submit an SPR.
ERR FILE INVALID	Copy the file ERR.ERR from the distribution medium to the system disk and use the DEFAULT option to install ERR.ERR as the system default.
ERR FILE NOT FOUND	Copy the file ERR.ERR from the distribution medium to the system disk and use the DEFAULT option to install ERR.ERR as the system default.
ERROR DETECTED WHILE READING ERROR RECORD SECTOR #n	Warning message only. Error occurred during reading of factory error records. Disregard the error message.
ERROR – KB INTERFACES OUT OF SEQUENCE	Regenerate. If the problem recurs, submit an SPR.
ERROR – NO SETUP FOR DISK xx:	Regenerate. If the problem recurs, submit an SPR.
ERROR – UNKNOWN DISK xx:	Regenerate. If the problem recurs, submit an SPR.
EXCESSIVE BAD CLUSTERS	If you need to use the current disk, use DSKINT to increase the pack cluster size. If the error recurs, use a different disk.
FATAL DISK ERROR DURING CONTROL RESET	Retry the DSKINT. If the error recurs, call the DIGITAL field service engineer to repair the disk drive.
FATAL ERROR – NO SMALL BUFFERS LEFT	Regenerate the system and configure more small buffers.
xxx FILE NOT FOUND WHEN REMOVING IT	Warning message only. xxx is SIL, RTS, or ERR. The initialization code did not find a file when trying to make it deletable.
[P,PN] filnam.ext HAS A BAD BLOCK	CLEAN asks whether to delete the file and confirms your response.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
DECTAPE INPUT ERROR	Ensure that the DECtape drive is clean and properly aligned. If the error recurs, try another drive.
DEFAULT RTS HAS INVALID SIZE PARAMETERS	Regenerate.
DEFAULT RTS NOT FOUND OR INVALID	Ensure that a valid run-time system is on the system disk. Regenerate if necessary.
DEVICE xx: DOES NOT INTERRUPT – DEVICE DISABLED	Use HARDWR to set the correct vector address for xx: or call the DIGITAL field service engineer.
DEVICE ERROR WHEN TRYING TO BOOTSTRAP DEVICE	Ensure that the device is on-line and ready. If the error recurs, try a different device.
DIRECTORY ENTRY FOR [P,PN] filnam.ext CONTAINS PACK CLUSTER NUMBER WHICH IS TOO BIG	CLEAN asks whether to delete the file and confirms your response.
DIRECTORY ERROR DETECTED IN RDB	Reinitialize the disk.
DIRECTORY ERROR – FILE NOT FOUND	Reinitialize the disk.
DIRECTORY MAP IN FIRST BLOCK OF [P,PN] DISAGREES WITH MFD	CLEAN asks whether to delete the account and confirms your response.
[0,1] DIRECTORY NOT FOUND	Reinitialize the disk.
DISK BLOCK 0 (REQUIRED FOR BOOTSTRAPS) IS BAD	Reinitialize the disk. If the error recurs, use a different disk.
DISK ERROR DURING DSKINT BUILD PHASE	Reinitialize the disk. If the error recurs, use a different disk.
DISK STRUCTURE IS IRREVOCABLY CORRUPT	Reinitialize the disk.
DOUBLY ALLOCATED BLOCK FOUND AT DEVICE CLUSTER nn. THE BLOCK IS ALLOCATED TO [p,pn] filnam.ext AND [p,pn] filnam.ext	CLEAN lets you choose the file to delete, then confirms your response.
DRIVE NOT READY:	Ensure that the disk drive is on-line and READY. Press the LINE FEED key to retry the operation. Type any other character to abort the operation.

APPENDIX B
SYSTEM GENERATION ERROR MESSAGES

B.1 INITIALIZATION CODE ERROR MESSAGES

The RSTS/E system initialization code routines make many checks to ensure the consistency of system structures. Initialization routines compare existing structures with their definitions and with references in other parts of the system. The checks must be successful; if not, the routines detect a consistency error, which indicates that the system is corrupted.

The initialization routines may also encounter errors while attempting to execute initialization options. The error text for many of these errors is preceded by the message FATAL RSTS/E SYSTEM INITIALIZATION ERROR. The initialization code prints a descriptive error message and returns to the OPTION: prompt. If such an error occurs, follow the error recovery procedures in Table B-1. If these procedures are unsuccessful, consult your DIGITAL Software Support Specialist.

For many of the errors, no recovery procedures exist. If such an error occurs, you should submit a Software Performance Report (SPR) as noted in the Recovery Procedures column for that error message.

Table B-1
Initialization Code Error Messages

Message	Recovery Procedure
BAD [0, 1] DIRECTORY	Rebootstrap the system disk and retry the operation. If the retry fails, use DSKINT to reinitialize the disk.
BADB.SYS NOT FOUND -- RESULTS UNPREDICTABLE	Rebootstrap the system disk and retry the operation. If the retry fails, use DSKINT to reinitialize the disk.
BUFF.SYS NOT FOUND OR TOO SMALL -- DECTAPE DISABLED	Warning message only. Shut down the system and use REFRESH to create the file at the required size.
CANNOT REFRESH THIS DISK	Reinitialize the disk.
CANNOT START WITH THIS SWAP MAX AND MEMORY TABLE	Use DEFAULT to change the swap max and/or memory allocation table.
CLUSTER 1 (REQUIRED FOR MFD) CONTAINS A BAD BLOCK	If the pack cluster size for the disk is greater than the device cluster size, use DSKINT to reinitialize the disk with a lower pack cluster size. If the error recurs, use a different disk.
CLUSTER ALLOCATED TO [p,pn] filnam.ext IS NOT ON A PACK CLUSTER BOUNDARY	CLEAN asks whether to delete the file, then confirms your response.

In response to the $ character, type the 2-character device code and the unit number of the device to be bootstrapped. Terminate your response by pressing the RETURN key. Table A-4 lists the device codes.

Table A-4
Device Codes for M9301-YF Bootstrap

Device	Code
TU10/TS03 Magtape	MT
TU16/TU45 Magtape	MM
RK05 Disk Cartridge	DK
RK06 Disk Cartridge	DM
RP02/RP03 Disk Pack	DP
RP04/RP05/RP06 Disk Pack	DB
RS03/RS04 Fixed Head Disk	DS
TU56 DECtape	DT

A.7 M9301-YC PROCEDURE

If the M9301-YC bootstrap is on the system, perform the following steps.

Move the CPU ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the start address of 17765000 in the console switches.

Press the CPU LOAD ADDR switch.

Set the device unit number in switches 0 through 2.

Set the device code for the device to be bootstrapped in switches 3 through 6. Table A-3 lists the device codes.

Table A-3
Device Codes for M9301-YC Bootstrap

Device	Code
TM11/TU10/TS03 Magtape	1
TC11/TU56 DECtape	2
RK11/RK05 Disk Cartridge	3
RP11/RP03 Disk Pack	4
RH70/TU16/TU45 Magtape	6
RH70/RP04/RP05/RP06 Disk Pack	7
RH70/RS03/RS04 Fixed Head Disk	10

Ensure that switches 7 through 21 are off (down).

Press the CPU START switch.

NOTE

Before the M9301-YC bootstrap actually bootstraps the system, it performs CPU tests, instruction and addressing tests, and memory and cache tests. If a hardware failure is detected, the diagnostic program halts. The lights contain the ROM address of the halt. If this occurs, call the DIGITAL field service engineer.

It may, however, be possible to continue with the bootstrap operation if the lights contain the address 1773764, which indicates a cache failure. To continue in this case, press CONT. This is the ONLY case in which it is possible to continue bootstrapping after the diagnostic detects an error.

A.8 M9301-YF PROCEDURE

If the M9301-YF Bootstrap Terminator is on the system, perform the following steps.

While holding down the CTRL switch, press the BOOT switch on the front of the computer.

The bootstrap prints the contents (in octal) of registers R0, R4, the Stack Pointer, and R5 at the console terminal. It then prints a prompting $ character.

Address	Contents
010000	012700
010002	172524
010004	005310
010006	012740
010010	060011
010012	105710
010014	100376
010016	005710
010020	100767
010022	012710
010024	060003
010026	105710
010030	100376
010032	005710
010034	100777
010036	005007

Set the Console Switch Register to 010000.

Press the CPU LOAD ADRS switch.

Press the CPU START switch.

If the system reads the tape but halts at address 010034, the magtape generated a parity error. Try another drive. If the system appears to take no action and halts, verify the accuracy of the routine by using the CPU Console EXAM switch. Use the Switch Register and the DEP switch to correct any erroneous contents. Rewind the tape to its load point before executing the routine again. If no recovery is successful, you should have a DIGITAL field service representative check the device. If the hardware is working properly, you should use a new magtape reel.

A.6 M9301-YA AND M9301-YB PROCEDURE

If the M9301-YA or M9301-YB Bootstrap Terminator is on the system, perform the following steps.

While holding down the CTRL switch, press the BOOT switch on the front of the computer.

The bootstrap prints the contents (in octal) of registers R0, R4, the Stack Pointer, and the Program Counter at the console terminal. It then prints a prompting $ character.

In response to the $ character, type the 2-character device code and the unit number of the device to be bootstrapped. Terminate your response by pressing the RETURN key. The following are the device codes:

Table A-2
Device Codes for M9301-YA and M9301-YB Bootstraps

Device	Code
TU10/TS03	MT
*TU16/TU45 Magtape	MM
RK05 Disk Cartridge	DK
RP02/RP03 Disk Pack	DP
*RP04/RP05/RP06 Disk Pack	DB
*RS03/RS04 Fixed Head Disk	DS
TU56 DECtape	DT

*M9301-YB Bootstrap Terminator only.

A.4 MR11-DB PROCEDURE

If the MR11-DB Bulk Storage Loader is on the system, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to one of the following values.

773100 for RF11 disk
773110 for RK11 disk cartridge
773154 for RP03 disk pack
773136 for TM11/TU10 magtape
773120 for TC11/TU56 DECtape

Press the CPU LOAD ADRS switch.

Press the CPU START switch.

A.5 BM792-YB PROCEDURE

If the BM792-YB Hardware Loader is on the system, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to 773100.

Press the CPU LOAD ADRS switch.

Set the CPU Switch Register to one of the following values.

777462 for RF11 disk
777406 for RK11 disk cartridge
776716 for RP03 disk pack
777344 for TC11/TU56 DECtape

Press the CPU START switch.

To bootstrap a TM11/TU10 magtape when the system has neither the BM873 nor the MR11-DB loader, you must manually enter a load routine into memory using the CPU console Switch Register and the DEP switch.

To load the routine, perform the following steps.

Move the CPU Console ENABLE/HALT Switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to 010000.

Press the CPU LOAD ADRS switch.

Load the following contents into memory using the Switch Register and DEP switch.

A.1 BM873-YA PROCEDURE

If the BM873-YA Restart/Loader is on the system, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to one of the following values.

773000 for RF11 disk
773010 for RK11 DISK CARTRIDGE
773100 for RP02 or RP03 disk pack
773050 for TM11/TU10 magtape
773030 for TC11/TU56 DECtape

Press the CPU LOAD ADRS switch.

Press the CPU START switch

A.2 BM873-YB PROCEDURE

If the BM873-YB Restart/Loader is on the system, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to one of the following values.

773030 for RK11 disk cartridge
773136 for RF11 disk
773320 for RP04 disk pack
773032 for RK11 disk unit specified in the Switch Register
773322 for RP04 disk unit specified in the Switch Register
773352 for RP02 or RP03 disk unit specified in the Switch Register
773350 for RP02 or RP03 disk pack
773110 for TM11/TU10 magtape
773150 for TM02/TU16 magtape
773070 for TC11/TU56 DECtape

Press the CPU LOAD ADRS switch.

If necessary, set the CPU Switch Register to the unit number of the disk drive being bootstrapped.

Press the CPU START switch.

A.3 H324 PUSHBUTTON PANEL PROCEDURE

If the system includes the H324 Pushbutton Panel option for the BM873 Restart/Loader, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

While holding down the UNLOCK switch, press the appropriate switch to bootstrap the desired device. The DIGITAL field service engineer who installed the computer should have informed you of the device that each switch bootstraps.

Press the CPU START switch.

APPENDIX A
HARDWARE BOOTSTRAP PROCEDURES

Bootstrapping a device involves using the central processor unit (CPU) console switches to access and initiate a hardware loader. The hardware loader contains machine instructions for reading a special record from the device. The record, called a bootstrap record, is transferred into memory and executes a specially designed software program. For the bootstrap operation to succeed, the device accessed must be on line and ready; the medium accessed must contain a proper bootstrap record; and the console terminal must be on line.

The console switches and their use are described in Chapter 11 of the PDP-11/70 Processor Handbook and in Sections 8.5 and 10.6 of the PDP-11/04/05/10/35/40/45 Processor Handbook. The bootstrap procedure that you should use depends upon the type of hardware bootstrap device on the system. Table A-1 summarizes the addresses needed to bootstrap each device. The detailed procedures to bootstrap a device are presented according to the types of hardware bootstrap devices available.

Table A-1
Summary of Hardware Bootstrap Addresses

Device to Bootstrap	Bootstrap Type							
	BM873-YA	BM873-YB[1]	MR11-DB	BM792-YB[2]	M9301-YA	M9301-YB	M9301-YC[3]	M9301-YF
RF11 Disk	773000	773136	773100	777462				
RS03/RS04 Disk					DS	DS	100	DS
RK11 disk cartridge Unit 0	773010	773030	773110	777406	DK	DK	30	DK
RP02 or RP03 disk pack unit 0	773100	773350	773154	776716	DP	DP	40	DP
RP04, RP05, or RP06 disk pack unit 0		773320				DB	70	DB
RK11 disk (unit n)		773032			DKn	DKn	30+n	DKn
RK611 disk (unit n)								DMn
RP02 or RP03 disk pack (unit n)		773352			DPn	DPn	40+n	DPn
RP04, RP05, or RP06 disk		773322				DBn	70+n	DBn
TU10 and TS03 magtape	773050	773110	773136	see footnote No. 4	MT	MT	10	MT
TU16 and TU45 magtape		773150				MM	60	MM
TC11/TU56 DECtape	773030	773070	773120	777344	DT	DT	20	DT

[1]To bootstrap a nonzero disk unit, set the address in the Switch Register, press the LOAD ADRS switch, set the unit number in the Switch Register, and press the START switch.
[2]For the BM792-YB loader, set the address 773100 in the Switch Register, press the LOAD ADRS switch, set the value from the table in the Switch Register, and press the START switch.
[3]For the M9301-YC loader, set the address 17765000 in the Switch Register, press the LOAD ADRS switch, set the value from the table in the Switch Register (unit number in switches 0-2), and press the START switch.
[4]To bootstrap a TU10 or TS03 magtape, use the loading routine described in Section A.5.

To use the new BASIC-PLUS as an auxiliary run-time system, run the UTILTY program. Issue the ADD RTS command to add the run-time system for use under RSTS/E.

If the new default run-time system uses a different math package, you may need to create a new system library. Programs compiled using a 2-word math package will run under any other 2-word math package. A program that was compiled using a 2-word math package produces the ?WRONG MATH PACKAGE and ?PROGRAM LOST – SORRY error messages when you attempt to run it under a 4-word math package. The converse is true for programs compiled under a 4-word math package.

To create a new library, log into a privileged account and use the BUILD program. BUILD allows you to create the library on a public or private disk. Physically and logically mount the output disk, then physically mount the first volume of the system library distribution kit. Write-protect this volume. If the distribution medium is disk, use the MOUNT command (including the /RO switch) to logically mount the disk. Then type RUN $BUILD to run the BUILD program. The following is the BUILD program dialogue:

```
SYSTEM BUILD?
TARGET SYSTEM DEVICE <SY0:>?
SOURCE INPUT DEVICE?
LIBRARY OUTPUT DEVICE <SY:>?
LIBRARY ACCOUNT <[1,2]>?
```

Answer YES to the SYSTEM BUILD question. The BUILD program then prints the TARGET SYSTEM DEVICE question. The default response is the current system disk. To specify another disk, type its device name and unit number, followed by a colon. The disk must be logically mounted and write-enabled.

In response to the SOURCE INPUT DEVICE question, specify the distribution disk or tape and its unit number. As the LIBRARY OUTPUT DEVICE, specify the device name and unit number to which to write the new library. Specify the desired library account in response to the final question.

The BUILD program runs and creates the files on the specified account. When finished, BUILD prints the BUILD COMPLETE and READY messages. If the distribution medium is DECtape, you must now rerun BUILD to create the files on the second DECtape. Mount the DECtape and follow the procedures as described above, specifying NO to the SYSTEM BUILD question. BUILD does not ask the TARGET SYSTEM DEVICE question. In response to the CONTROL FILE IS question, type $BUILD.CTL. The program then builds the programs from the second DECtape. Mount and write-lock the third DECtape (DEC-11-ORSCA-E-UA3) and run BUILD again to complete the standard library build.

To build the large system programs, physically mount the next system library distribution vblume. (If the distribution medium is RK06 disk, use the same volume as for the standard library build.) Write-protect this volume. If the distribution medium is disk, logically mount it by using the MOUNT command (including the /RO switch). Then type RUN $BUILD.

Answer NO to the SYSTEM BUILD question, and answer the SOURCE INPUT DEVICE, LIBRARY OUTPUT DEVICE, and LIBRARY ACCOUNT questions as you did for the standard library build. In response to the CONTROL FILE IS question, specify $SPLER.CTL. For DECtape, specify the device on which the third tape is mounted. The BUILD program runs and creates the large programs as requested. The BUILD COMPLETE and READY messages signal the end of the BUILD procedure. If the distribution medium is DECtape, you must run BUILD seven more times (as you did the first time you built the large programs) from the seven remaining DECtapes (DEC-11ORSCA-E-UC4 through DEC-11-ORSCA-E-UC10).